Research Note 82-29

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A FORECAST OF ARMY AVIATION TRAINING RESEARCH
AND DEVELOPMENT REQUIREMENTS FOR THE PERIOD
1985-2000 VOLUME II: APPENDICES

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This research note presents the results of a survey designed to identify U.S.
Army aviation system and subsystem acquisitions projected for the time period
of 1985 to 2000 which will require behavioral research to support development
of new aircrew training methods and equipment. Survey results are presented
in questionnaire format, as they were originally obtained, together with
information on scoring model weighting, and a complete listing of the
bibliographical references.

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Item 20 (Continued)

The related technical report (ARI Technical Report TR 565) describes the conduct and results of three tasks: (a) a survey to identify future Army aviation related systems and subsystems; (b) the identification of systems with unique training needs; and (c) the determination of training requirements and the forecasting of behavioral research requirements for the systems with unique training needs.

This research is intended to assist the Army in identifying behavioral research requirements for future Army aviation aircrew training before the new aviation systems and subsystems are introduced. The lead time provided the early initiation of behavioral research programs should aid the development of effective training systems. Requirements for the behavioral research needed to support Army aviation training programs in the time frame 1985 to 2000 are described in this report. This document presents an integrated and future-oriented review of U.S. Army aviation training R&D needs.

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APPENDIX A
COMPLETED QUESTIONNAIRES

APPENDIX A
COMPLETED QUESTIONNAIRES

The University of Dayton conducted eleven interview sessions at three Army agencies in this study. A list of agencies involved in each interview session and systems discussed is presented below. The results of all of the interviews, as recorded on the survey instruments at the time of the interviews, are presented in this appendix so that original records are not lost.

Interview Session	Organization	Systems/Subsystems Discussed	Date of Interview
1.	TRADOC, Ft. Rucker	Near-term Scout Helicopter	5/06/80
2.	TRADOC, Ft. Rucker	Attack Helicopter	5/06/80
3.	TRADOC, Ft. Rucker	LHX-Scout SEMA-X	5/06/80
4.	PMO for ASH DARCOM, St. Louis	Near-term Scout Helicopter Advanced Scout Helicopter	5/28/80
5.	PMO for Black Hawk DARCOM, St. Louis	Black Hawk	5/28/80
6.	AVRADCOM, St. Louis	A/C Rocket Subsystems A/C Guns Subsystems Fire Control	5/27/80
7.	AVRADCOM, St. Louis	ADAS, Landing Subsystems	5/27/80
8.	AVRADCOM, St. Louis	LH-X SEMA-X	5/27/80
9.	PMO for AAH, DARCOM, St. Louis	AAH	5/28/80
10. & 11.	AVRADCOM, St. Louis	ADOCS IDSV	5/27-28/80

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE ___6 May 1980___   QUESTIONNAIRE NO. ___1___

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation systems and system characteristics which will require behavioral changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation inventory for the period of 1985 to 2000 (within your area of cognizance)?

  1.1   _Mast Mounted Sight/FLIR/Laser Designator_

  1.2   _Air-to-Air Missile_

  1.3   _Advanced Navigation (Doppler, GPS, PLARS_

  1.4   _HUD/Advanced Night Vision_
  1.5   _Threat Detector_
  1.6   _Advanced Scout Airframe_

Question 2   What are the probabilities that each of these new systems will be introduced into Army inventory? (Values of probability are defined as 1.0 = almost certain, 0.8 = highly probable, 0.6 = probable, 0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	_Sight_	_0.8 (Laser) 0.9 (MMS), 1.0 (FLIR)_
2.2	_Missile_	_0.8_
2.3	_Navigation_	_1.0_
2.4	_Display_	_0.6 (HUD), 1.0 (Advanced Nav.)_
2.5	_Threat_	_0.7_

Question 3   What are the scheduled years for introducing each of these new aviation systems?

	New System	Year
3.1	Sight	1985 (IOC)
3.2	Missile	Beyond 1985
3.3	Navigation	1985
3.4	Displays	1990 (HUD) 1985 (Adv. Nav.)
3.5	Threat	1985

Question 4   How extensive will be the use of each of these new systems? (Degrees of use are defined as "a" = more than three thousand items, "b" = one to three thousand items, "c" = three hundred to one thousand items, "d" = one to three hundred items, and "e" = thirty to one hundred items.)

	New System	Degree of Use
4.1	Sight	C
4.2	Missiles	A
4.3	Navigation	C
4.4	Display	C
4.5	Threat	C

Question 5   What are the current systems, if any, to be replaced by each of these systems?

	New Systems	Current Systems
5.1	Sight	Stabilized Monocular
5.2	Missiles	Nothing (A/G)
5.3	Navigation	Nothing
5.4	Displays	Navigation
5.5	Threat	Nothing

The questionnaire responder should answer Questions 6 to 12, on separate sheets, for each of the new systems identified in the answer to Question 1.

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New System _Mast Mounted Sight/FLIR/Laser_

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of physical characteristics? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	
6.1.2 Instruments	_B_
6.1.3 Displays	
6.1.4 Power Controls	
6.1.5 Seating Arrangement	
6.1.6 Visibility	
6.1.7 Weapon Guidance	_A_
6.1.8 Guns	
6.1.9 Rockets	
6.1.10 Laser	_A_
6.1.11 Threat Detection	
6.1.12 Navigation	
6.1.13 Communication	
6.1.14 ECM/EW	
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

_Laser: New concept in weapon aiming. Laser designation for
other aircraft weapons. Laser designation for artillery._

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

Displa . - 2 CP ~ large one for gunner, small one for pilot

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System _Mast Mounted Sight/FLIR/Laser_

Question 7.1 How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Performance		Degree of Difference
7.1.1	Maneuverability	D
7.1.2	Flight Stability	D
7.1.3	Control Responsiveness . .	D
7.1.4	Flying Workload	B
7.1.5	Flight Safety Character- istics	
7.1.6	Complexity	C
7.1.7	Speed	
7.1.8	Target Detection Capa- bilities	A
7.1.9	Weapon Range	
7.1.10	Weapon Accuracy	A
7.1.11	Troop Capacity	
7.1.12	Cargo Capacity	
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2 For the performances rated "radically different", what is the nature of the difference?

See Question 6.2

Question 7.3 For the performances rated "substantially different", what is the nature of the difference?

Pilot workload, new switches, need to monitor

Question 7.4 For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

More tasks than one person (pilot) can do

New System _Mast Mounted Sight/FLIR/Laser_

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

Operation	Degree of Difference
8.1.1 Basic Flying	
8.1.2 Instrument Flying	
8.1.3 Nap of Earth Flying	
8.1.4 Navigation	
8.1.5 Communication	D
8.1.6 Other (Specify) _Terrain Masking_ .	A
8.1.7 Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

_Replace "pop-up" with terrain masking. Need to train and practice
using MMS to clear terrain without exposing helicopter._

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System   *Mast Mounted Sight/FLIR/Laser*

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	
9.1.3	Weapon Aiming and Firing . . .	B
9.1.4	Air-to-Air Combat Flight Maneuvers	
9.1.5	Air-to-Ground Combat Flight Maneuvers	
9.1.6	Multiple Aircraft Operation .	C
9.1.7	Reconnaissance	C
9.1.8	Command and Control Information Processing	
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

See Question 6.2

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Multiple aircraft or aircraft/artillery coordination

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

9.1.6 See Question 9.3
9.1.7 Night use of FLIR

New System ___Mast Mounted Sight/FLIR/Laser___

Question 10.1 What are the differences in <u>man-machine skill requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	_B/C_
10.1.2	Tracking Outside Aircraft . .	_____
10.1.3	Recognition	_____
10.1.4	Memory	_____
10.1.5	Decision-Making	_C_
10.1.6	Physical Responses	_____
10.1.7	Other (Specify)	_____
10.1.8	Other (Specify)	_____

Question 10.2 For the skills rated "radically different", what is the nature of the difference?

Question 10.3 For the skills rated "substantially different", what is the nature of the difference?

Displays: for gunner a new set of control/displays

Decision: laser set code
designate at proper time, don't designate too long

Question 10.4 For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

Displays: pilot displays

New System _Mast Mounted Sight/FLIR/Laser_

Question 11.1   What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	_C_
11.1.2	Non-Verbal Exchange	_C_
11.1.3	Coordinated Physical Responses	___
11.1.4	Other (Specify)	___
11.1.5	Other (Specify)	___

Question 11.2   For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4   For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

Non-verbal: symbols on monitor to show targets

New System _Mast Mounted Sight/FLIR/Laser_

Question 12.1   In terms of training methods, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing training
difference instead of system operation differences,
i.e., differences in system operation might not
always necessitate differences in training methods.)

Training Areas	Degree of Difference
12.1.1 Basic Flying	
12.1.2 Instrument Flying	
12.1.3 Nap of Earth Flying	
12.1.4 Navigation	
12.1.5 Communications	
12.1.6 Target Detection	C
12.1.7 Target Attack	
12.1.8 Weapon Aiming and Firing . .	B
12.1.9 Air-to-Air Combat Flight Maneuvers	
12.1.10 Air-to-Ground Combat Flight Maneuvers	
12.1.11 Multiple Aircraft Operations	C
12.1.12 Reconnaissance	
12.1.13 Command and Control Information Processing	
12.1.14 Other (Specify)	
12.1.15 Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

Slightly different technique

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New System___Air-to-Air Missile_____

Question 6.1   How much difference will there be between the new
               system and the current systems which it replaces
               in terms of <u>physical characteristics</u>? (Degrees of
               difference are defined as: "a" = radically different;
               "b" = substantially different; "c" = somewhat
               different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	
6.1.2 Instruments	
6.1.3 Displays	
6.1.4 Power Controls	
6.1.5 Seating Arrangement	
6.1.6 Visibility	
6.1.7 Weapon Guidance	
6.1.8 Guns	A
6.1.9 Rockets	A
6.1.10 Laser	
6.1.11 Threat Detection	
6.1.12 Navigation	
6.1.13 Communication	
6.1.14 ECM/EW	
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
               is the nature of the difference?

               Entirely new concept

Question 6.3   For the components rated "substantially different",
               what is the nature of the difference?

Question 6.4   For the components rated "somewhat different", is
               the difference enough to require a change in training
               methods? If so, indicate the nature of the difference.

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New System _Air-to-Air Missile_

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	_____
7.1.2	Flight Stability	_____
7.1.3	Control Responsiveness . .	_____
7.1.4	Flying Workload	_____
7.1.5	Flight Safety Character-istics	_____
7.1.6	Complexity	_____
7.1.7	Speed	_____
7.1.8	Target Detection Capa-bilities	_____
7.1.9	Weapon Range	_A_
7.1.10	Weapon Accuracy	_____
7.1.11	Troop Capacity	_____
7.1.12	Cargo Capacity	_____
7.1.13	Other (Specify)	_____
7.1.14	Other (Specify)	_____

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

No counterpart

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System _Air-to-Air Missile_

Question 8.1   In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	_____
8.1.2	Instrument Flying	_____
8.1.3	Nap of Earth Flying	_____
8.1.4	Navigation	_____
8.1.5	Communication	_____
8.1.6	Other (Specify) _Target Detection_	A
8.1.7	Other (Specify)	_____

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Threat Detection
Point Helicopter
IR Seeker (Tone)
FLIR

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System   _Air-to-Air Missile_

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	<u>Operation</u>	<u>Degree of Difference</u>
9.1.1	Target Detection	
9.1.2	Target Attack	
9.1.3	Weapon Aiming and Firing . . .	
9.1.4	Air-to-Air Combat Flight Maneuvers	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	
9.1.6	Multiple Aircraft Operation .	
9.1.7	Reconnaissance	
9.1.8	Command and Control Information Processing	
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

See Question 8.2

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System   *Air-to-Air Missile*

Question 10.1   What are the differences in <u>man-machine skill</u> <u>requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Skill Category	Degree of Difference
10.1.1 Monitoring Displays	
10.1.2 Tracking Outside Aircraft . .	D
10.1.3 Recognition	D
10.1.4 Memory	
10.1.5 Decision-Making	D
10.1.6 Physical Responses	
10.1.7 Other (Specify)	
10.1.8 Other (Specify)	

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System _Air-to-Air Missile_

Question 11.1 What are the differences in <u>crew interaction</u> requirements between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Interaction Category	Degree of Difference
11.1.1 Verbal Exchange	_D_
11.1.2 Non-Verbal Exchange	_D_
11.1.3 Coordinated Physical Responses	_D_
11.1.4 Other (Specify)	___
11.1.5 Other (Specify)	___

Question 11.2 For the interactions rated "radically different", what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different", what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different", is the difference enough to require a change in training methods?

New System *Air-to-Air Missile*

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	_____
12.1.2	Instrument Flying	_____
12.1.3	Nap of Earth Flying	_____
12.1.4	Navigation	_____
12.1.5	Communications	_____
12.1.6	Target Detection	_____
12.1.7	Target Attack	_____
12.1.8	Weapon Aiming and Firing . .	_____
12.1.9	Air-to-Air Combat Flight Maneuvers	_c_
12.1.10	Air-to-Ground Combat Flight Maneuvers	_____
12.1.11	Multiple Aircraft Operations	_____
12.1.12	Reconnaissance	_____
12.1.13	Command and Control Information Processing	_____
12.1.14	Other (Specify)	_____
12.1.15	Other (Specify)	_____

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

New System *Advanced Navigation*

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

	Component	Degree of Difference
6.1.1	Flight Controls	
6.1.2	Instruments	
6.1.3	Displays	*B*
6.1.4	Power Controls	
6.1.5	Seating Arrangement	
6.1.6	Visibility	
6.1.7	Weapon Guidance	
6.1.8	Guns	
6.1.9	Rockets	
6.1.10	Laser	
6.1.11	Threat Detection	
6.1.12	Navigation	*B*
6.1.13	Communication	
6.1.14	ECM/EW	
6.1.15	Other (Specify)	
6.1.16	Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

>   *Display: moving map for Advanced Scout Helicopter*
>   *   digital for Interim Scout Helicopter*

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

>   *Easier on crew (less workload)*

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System   *Advanced Navigation*

Question 7.1   How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	_____
7.1.2	Flight Stability	_____
7.1.3	Control Responsiveness . .	_____
7.1.4	Flying Workload	_____
7.1.5	Flight Safety Characteristics	_____
7.1.6	Complexity	_____
7.1.7	Speed	_____
7.1.8	Target Detection Capabilities	_____
7.1.9	Weapon Range	_____
7.1.10	Weapon Accuracy	_____
7.1.11	Troop Capacity	_____
7.1.12	Cargo Capacity	_____
7.1.13	Other (Specify) *Navigation Aircraft*	*B* _____
7.1.14	Other (Specify)	_____

Question 7.2   For the performances rated "radically different", what is the nature of the difference?

Question 7.3   For the performances rated "substantially different", what is the nature of the difference?

More accurate

Question 7.4   For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System _Advanced Navigation_

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	
8.1.2	Instrument Flying	
8.1.3	Nap of Earth Flying	_B_
8.1.4	Navigation	_B_
8.1.5	Communication	
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

Easier

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System ___Advanced Navigation___

Question 9.1   In terms of <u>combat operations tasks</u>, how much
                difference is there between the new system and
                current systems which it replaces? (Degrees of
                difference are defined in Question 6.1).

                            <u>Operation</u>   <u>Degree of Difference</u>

                9.1.1   Target Detection . . . .   __D__

                9.1.2   Target Attack . . . .   __D__

                9.1.3   Weapon Aiming and Firing . . .   __D__

                9.1.4   Air-to-Air Combat Flight
                        Maneuvers . . . .   __D__

                9.1.5   Air-to-Ground Combat Flight
                        Maneuvers . . . .   __D__

                9.1.6   Multiple Aircraft Operation .   __D__

                9.1.7   Reconnaissance . . . .   __D__

                9.1.8   Command and Control Informa-
                        tion Processing . . . .   __D__

                9.1.9   Other (Specify) . . . .   _____

                9.1.10 Other (Specify) . . . .   _____

Question 9.2   For the operations rated "radically different", what
                is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
                what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

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New System _Advanced Navigation_

Question 10.1   What are the differences in <u>man-machine skill</u> <u>requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	_B_
10.1.2	Tracking Outside Aircraft . .	
10.1.3	Recognition	
10.1.4	Memory	
10.1.5	Decision-Making	
10.1.6	Physical Responses	
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

Map/digital display (must train on use of digital display)

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System *Advanced Navigation*

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	D
11.1.2	Non-Verbal Exchange	D
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System   *Advanced Navigation*

Question 12.1   In terms of <u>training methods</u>, how much difference will there be between the new system and the current systems it replaces? (Note that this differs from Questions 8.1 and 9.1, by emphasizing <u>training</u> difference instead of <u>system operation</u> differences, i.e., differences in system operation might <u>not</u> always necessitate differences in training methods.)

	<u>Training Areas</u>	<u>Degree of Difference</u>
12.1.1	Basic Flying	
12.1.2	Instrument Flying	
12.1.3	Nap of Earth Flying	
12.1.4	Navigation	*C*
12.1.5	Communications	
12.1.6	Target Detection	
12.1.7	Target Attack	
12.1.8	Weapon Aiming and Firing . .	
12.1.9	Air-to-Air Combat Flight Maneuvers	
12.1.10	Air-to-Ground Combat Flight Maneuvers	
12.1.11	Multiple Aircraft Operations	
12.1.12	Reconnaissance	
12.1.13	Command and Control Information Processing	
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different", what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different", what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different", what is the nature of the difference?

Must still use maps but must learn an additional system

New System   *Threat Detector*

Question 6.1   How much difference will there be between the new
               system and the current systems which it replaces
               in terms of <u>physical characteristics</u>? (Degrees of
               difference are defined as: "a" = radically different;
               "b" = substantially different; "c" = somewhat
               different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	
6.1.2 Instruments	
6.1.3 Displays	c
6.1.4 Power Controls	
6.1.5 Seating Arrangement	
6.1.6 Visibility	
6.1.7 Weapon Guidance	
6.1.8 Guns	
6.1.9 Rockets	
6.1.10 Laser	
6.1.11 Threat Detection	c
6.1.12 Navigation	
6.1.13 Communication	
6.1.14 ECM/EW	
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
               is the nature of the difference?

Question 6.3   For the components rated "substantially different",
               what is the nature of the difference?

               New display (new capability)
               Audible alarm

Question 6.4   For the components rated "somewhat different", is
               the difference enough to require a change in training
               methods? If so, indicate the nature of the difference.

New System ___*Threat Detector*___

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	_____
7.1.2	Flight Stability	_____
7.1.3	Control Responsiveness . .	_____
7.1.4	Flying Workload	_____
7.1.5	Flight Safety Character-istics	_____
7.1.6	Complexity	_____
7.1.7	Speed	_____
7.1.8	Target Detection Capa-bilities	___D___
7.1.9	Weapon Range	_____
7.1.10	Weapon Accuracy	_____
7.1.11	Troop Capacity	_____
7.1.12	Cargo Capacity	_____
7.1.13	Other (Specify)	_____
7.1.14	Other (Specify)	_____

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System   *Threat Detector*

Question 8.1   In terms of <u>cockpit crew operations</u>, how much difference is there between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	
8.1.2	Instrument Flying	
8.1.3	Nap of Earth Flying	
8.1.4	Navigation	
8.1.5	Communication	
8.1.6	Other (Specify) *Threat Detection* .	*C*
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what is the nature of the difference?

Question 8.3   For the operations rated "substantially different", what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

     Capability to detect radar
     Tactics to use

New System ___Threat Detector___

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	<u>Operation</u>	<u>Degree of Difference</u>
9.1.1	Target Detection	_____
9.1.2	Target Attack	_____
9.1.3	Weapon Aiming and Firing . . .	_____
9.1.4	Air-to-Air Combat Flight Maneuvers	_____
9.1.5	Air-to-Ground Combat Flight Maneuvers	_____
9.1.6	Multiple Aircraft Operation .	_____
9.1.7	Reconnaissance	_____
9.1.8	Command and Control Information Processing	_____
9.1.9	Other (Specify) *Threat Detection* .	___C___
9.1.10	Other (Specify)	_____

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

See Question 8.4

New System _Threat Detector_

Question 10.1   What are the differences in man-machine skill
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	_c_
10.1.2	Tracking Outside Aircraft . .	_____
10.1.3	Recognition	_____
10.1.4	Memory	_____
10.1.5	Decision-Making	_____
10.1.6	Physical Responses	_____
10.1.7	Other (Specify)	_____
10.1.8	Other (Specify)	_____

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

Aural warning

New System __*Threat Detector*__

Question 11.1   What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	<u>Interaction Category</u>	<u>Degree of Difference</u>
11.1.1	Verbal Exchange	_____
11.1.2	Non-Verbal Exchange	_____
11.1.3	Coordinated Physical Responses	_____
11.1.4	Other (Specify)	_____
11.1.5	Other (Specify)	_____

Question 11.2   For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4   For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System _Threat Detector_

Question 12.1   In terms of training methods, how much difference
                 will there be between the new system and the current
                 systems it replaces? (Note that this differs from
                 Questions 8.1 and 9.1, by emphasizing training
                 difference instead of system operation differences,
                 i.e., differences in system operation might not
                 always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	_____
12.1.2	Instrument Flying	_____
12.1.3	Nap of Earth Flying	_____
12.1.4	Navigation	_____
12.1.5	Communications	_____
12.1.6	Target Detection	_____
12.1.7	Target Attack	_____
12.1.8	Weapon Aiming and Firing . .	_____
12.1.9	Air-to-Air Combat Flight Maneuvers	_____
12.1.10	Air-to-Ground Combat Flight Maneuvers	_____
12.1.11	Multiple Aircraft Operations	_____
12.1.12	Reconnaissance	_____
12.1.13	Command and Control Information Processing	_____
12.1.14	Other (Specify)	_____
12.1.15	Other (Specify)	_____

Question 12.2   For the training areas rated "radically different",
                 what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
                 what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
                 what is the nature of the difference?

Question 13   As stated at the beginning of the questionnaire
the objective of this study is to identify new Army
aviation systems and system characteristics which
will require behavioral changes necessitating new
training techniques.

Given this objective, is there anything further
which you believe will require changes in training
as a result of the introduction of new Army aviation
systems?

(a)   *Scout is integrator of weapons and tactics*

   3 Scouts/5 Attack   2 Scouts "normal"
   1 Scout "battle captain"
   Different training?

   Additional training in attack helicopter/weapons artillery

(b)   *Observer training - Minimal peacetime authorization*
   Questionable capability of recruit

(c)   *Pilot workload - 1 pilot*
   1 pilot and 1 observer
   2 pilots

(d)   *Simulators - Difficult for multiple visual targets, other*
   aircraft laser designating, etc.

(e)   *Lack of realistic war-game environment - no ranges*

(f)   *Avionics, laser, FLIR maintenance*

(g)   *Reduced instrument for training needs*

(h)   *Scout attrition*

(i)   *Advanced scout - No decision expected on configuration*
   Will require ordinary aircraft check-out
   training

DATE *6 May 1980*   QUESTIONNAIRE NO.   *1A*

RESPONDER'S NAME

RESPONDER'S ORGANIZATION

RESPONDER'S TITLE OR POSITION

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
               inventory for the period of 1985 to 2000 (within your
               area of cognizance)?

               1.1   *Near Term Scout Helicopter*
               1.2
               1.3
               1.4

Question 2   What are the probabilities that each of these new
               systems will be introduced into Army inventory?
               (Values of probability are defined as 1.0 = almost
               certain, 0.8 = highly probable, 0.6 = probable,
               0.4 = uncertain, and 0.2 = highly unlikely.)

                         New System   Probability

               2.1   *Near Term Scout Helicopter*   *1.0*
               2.2
               2.3
               2.4

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
3.1	*Near Term Scout Helicopter*	*1985*
3.2		
3.3		
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	*Near Term Scout Helicopter*	*c*
4.2		
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1		
5.2		
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on
separate sheets, for <u>each of the new systems</u> identified in the
answer to Question 1.

New System __Near Term Scout Helicopter__

Question 6.1 How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	
6.1.2 Instruments	B
6.1.3 Displays	B
6.1.4 Power Controls	
6.1.5 Seating Arrangement	
6.1.6 Visibility	
6.1.7 Weapon Guidance	A
6.1.8 Guns	A
6.1.9 Rockets	A
6.1.10 Laser	A
6.1.11 Threat Detection	C
6.1.12 Navigation	B
6.1.13 Communication	
6.1.14 ECM/EW	
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2 For the components rated "radically different", what
is the nature of the difference?

Question 6.3 For the components rated "substantially different",
what is the nature of the difference?

Question 6.4 For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System *Near Term Scout Helicopter*

Question 7.1 How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	D
7.1.2	Flight Stability	D
7.1.3	Control Responsiveness . .	D
7.1.4	Flying Workload	B
7.1.5	Flight Safety Character-istics	
7.1.6	Complexity	C
7.1.7	Speed	
7.1.8	Target Detection Capa-bilities	A
7.1.9	Weapon Range	A
7.1.10	Weapon Accuracy	A
7.1.11	Troop Capacity	
7.1.12	Cargo Capacity	
7.1.13	Other (Specify) *Navigating Aircraft*	B
7.1.14	Other (Specify)	

Question 7.2 For the performances rated "radically different",
what is the nature of the difference?

Question 7.3 For the performances rated "substantially different",
what is the nature of the difference?

Question 7.4 For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System *Near Term Scout Helicopter*

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
               difference is there between the new system and
               the current systems which it replaces? (Degrees
               of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	
8.1.2	Instrument Flying	
8.1.3	Nap of Earth Flying	B
8.1.4	Navigation	B
8.1.5	Communication	D
8.1.6	Other (Specify)	A
8.1.7	Other (Specify)	A

Question 8.2   For the operations rated "radically different", what
               is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
               what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
               the difference enough to require a change in
               training methods? If so, indicate the nature of
               the difference.

New System   *Near Term Scout Helicopter*

Question 9.1   In terms of combat operations tasks, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	D
9.1.3	Weapon Aiming and Firing . . .	B
9.1.4	Air-to-Air Combat Flight Maneuvers	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	D
9.1.6	Multiple Aircraft Operation .	C
9.1.7	Reconnaissance	C
9.1.8	Command and Control Information Processing	
9.1.9	Other (Specify)	C
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System ___Near Term Scout Helicopter___

Question 10.1   What are the differences in <u>man-machine skill</u>
<u>requirements</u> between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	<u>Skill Category</u>	<u>Degree of Difference</u>
10.1.1	Monitoring Displays	_B_
10.1.2	Tracking Outside Aircraft . .	_D_
10.1.3	Recognition	_D_
10.1.4	Memory	
10.1.5	Decision-Making	_C_
10.1.6	Physical Responses	
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

New System _Near Term Scout Helicopter_

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	C
11.1.2	Non-Verbal Exchange	C
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System: _Near Term Scout Helicopter_

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

	<u>Training Areas</u>	<u>Degree of Difference</u>
12.1.1	Basic Flying	
12.1.2	Instrument Flying	
12.1.3	Nap of Earth Flying	
12.1.4	Navigation	_C_
12.1.5	Communications	
12.1.6	Target Detection	_C_
12.1.7	Target Attack	
12.1.8	Weapon Aiming and Firing . .	_B_
12.1.9	Air-to-Air Combat Flight Maneuvers	_C_
12.1.10	Air-to-Ground Combat Flight Maneuvers	
12.1.11	Multiple Aircraft Operations	_C_
12.1.12	Reconnaissance	
12.1.13	Command and Control Information Processing	
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

Question 13   As stated at the beginning of the questionnaire
               the objective of this study is to identify new Army
               aviation systems and system characteristics which
               will require behavioral changes necessitating new
               training techniques.

               Given this objective, is there anything further
               which you believe will require changes in training
               as a result of the introduction of new Army aviation
               systems?

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QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE   _7 May 1980_   QUESTIONNAIRE NO. _____2_____

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
              inventory for the period of 1985 to 2000 (within your
              area of cognizance)?

              1.1   _LH-X - Scout (Far Term)_
              1.2   _SEMA-X (Special Electronic Mission Aircraft)_
              1.3   _UH-60_
              1.4   _CH-47C_

Question 2   What are the probabilities that each of these new
              systems will be introduced into Army inventory?
              (Values of probability are defined as 1.0 = almost
              certain, 0.8 = highly probable, 0.6 = probable,
              0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	_LH-X - Scout_	_0.5_
2.2	_SEMA-X_	_0.9_
2.3	_UH-60_	_1.0_
2.4	_CH-47D_	_1.0_

Question 3   What are the scheduled years for introducing each of these new aviation systems?

	New System	Year
3.1	LH-X	Late 1990s
3.2	SEMA-X	Late 1990s
3.3	UH-60	In the field
3.4	CH-47 D	In the field

Question 4   How extensive will be the use of each of these new systems? (Degrees of use are defined as "a" = more than three thousand items, "b" = one to three thousand items, "c" = three hundred to one thousand items, "d" = one to three hundred items, and "e" = thirty to one hundred items.)

	New System	Degree of Use
4.1	LH-x	C
4.2	SEMA-X	D
4.3	UH-60	B
4.4	CH-47 D	B

Question 5   What are the current systems, if any, to be replaced by each of these systems?

	New Systems	Current Systems (with Mast Mounted Sight)
5.1	LH-X	OH-58 Augmentation
5.2	SEMA-X	High side of SEM aircraft
5.3	UH-60	Augment UH-1 fleet
5.4	CH-47D	CH-47 A, B, C

The questionnaire responder should answer Questions 6 to 12, on separate sheets, for each of the new systems identified in the answer to Question 1.

New System _LH-X_

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of physical characteristics? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	A
6.1.2 Instruments	B
6.1.3 Displays	B
6.1.4 Power Controls	B
6.1.5 Seating Arrangement	?
6.1.6 Visibility	D
6.1.7 Weapon Guidance	N/A
6.1.8 Guns	D
6.1.9 Rockets	D
6.1.10 Laser	N/A
6.1.11 Threat Detection	A
6.1.12 Navigation	B
6.1.13 Communication	B
6.1.14 ECM/EW	B
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

Flight Controls - Electro-optic, multiplex, digital, EMP hardened,
fly-by-wire
Threat Detection - New device and technique, optimum maneuvers,
primary air-to-air missile

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

6.1.4 EMP hardened, full electronic control

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

Instruments - Multiplex, common function, IX
Displays - Multiplex, common function, IX
Power Controls - Electrical control, EMP hardened

New System _LH-X_

Question 7.1 How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

		Performance	Degree of Difference
7.1.1	Maneuverability	. . . . . .	B
7.1.2	Flight Stability	. . . . .	D
7.1.3	Control Responsiveness	. .	B
7.1.4	Flying Workload	. . . . . .	A
7.1.5	Flight Safety Characteristics	. . . .	A
7.1.6	Complexity	. . . .	B
7.1.7	Speed	. . . .	D
7.1.8	Target Detection Capabilities	. . . .	B
7.1.9	Weapon Range	. . . .	A
7.1.10	Weapon Accuracy	. . . . . .	A
7.1.11	Troop Capacity	. . . . . .	C
7.1.12	Cargo Capacity	. . . . . .	N/A
7.1.13	Other (Specify) _Survivability_	. . . . . .	B
7.1.14	Other (Specify) _Threat Detection_		B

Question 7.2 For the performances rated "radically different", what is the nature of the difference?

7.1.1 More maneuverable
7.1.3 More responsive
7.1.4 Unload pilot
7.1.5 Safer - crashworthy

Question 7.3 For the performances rated "substantially different", what is the nature of the difference?

7.1.6 More complex or reduced maintenance
7.1.8 Better target detection in adverse WX
7.1.13 Criteria for ballistic rounds up to 37 mm except for cockpit hits

Question 7.4 For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System ___LH-X___

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
                difference is there between the new system and
                the current systems which it replaces? (Degrees
                of difference are defined in Question 6.1).

	<u>Operation</u>	<u>Degree of Difference</u>
8.1.1	Basic Flying	D
8.1.2	Instrument Flying	D
8.1.3	Nap of Earth Flying	D
8.1.4	Navigation	C
8.1.5	Communication	D
8.1.6	Other (Specify) .*Single Man* . .	A
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
                is the nature of the difference?

> *8.1.6 Single man cockpit being considered. Driver for one
> man cockpit to reduce size, signature, and cost.*

Question 8.3   For the operations rated "substantially different",
                what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

> *8.1.4 Map display*

New System ___LH-X___

Question 9.1   In terms of combat operations tasks, how much
                difference is there between the new system and
                current systems which it replaces? (Degrees of
                difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	A
9.1.3	Weapon Aiming and Firing . . .	A
9.1.4	Air-to-Air Combat Flight Maneuvers	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	D
9.1.6	Multiple Aircraft Operation .	D
9.1.7	Reconnaissance	D
9.1.8	Command and Control Information Processing	B
9.1.9	Other (Specify) *Threat Detection*	A
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
                is the nature of the difference?

     9.1.1 *Millimeter wave radar*
     9.1.2 *Air-to-air or air-to-ground - Airborne Stinger*

Question 9.3   For the operations rated "substantially different",
                what is the nature of the difference?

     9.1.8 *Much command and control automated*

Question 9.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

New System_____ *LH-X* _____

Question 10.1 What are the differences in <u>man-machine skill requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	B
10.1.2	Tracking Outside Aircraft . .	B
10.1.3	Recognition	B
10.1.4	Memory	B
10.1.5	Decision-Making	C
10.1.6	Physical Responses	C
10.1.7	Other (Specify) . . . .*WX*. . .	A
10.1.8	Other (Specify)	

Question 10.2 For the skills rated "radically different", what is the nature of the difference?

10.1.7 Icing conditions okay to fly in

Question 10.3 For the skills rated "substantially different", what is the nature of the difference?

10.1.1 Pilot will be unloaded
10.1.2 PNVS
10.1.3 Helmet display or image intensification - adverse WX
10.1.4 More centralized, automated, better organized

Question 10.4 For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

10.1.5 Decision same, amount of information much greater
10.1.6 Flying skill requirements reduced

New System___*LH-X*_____

Question 11.1   What are the differences in <u>crew interaction</u> requirements between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	_D_
11.1.2	Non-Verbal Exchange	_B_
11.1.3	Coordinated Physical Responses	_D_
11.1.4	Other (Specify)	___
11.1.5	Other (Specify)	___

Question 11.2   For the interactions rated "radically different", what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different", what is the nature of the difference?

11.1.2 Cue each other on helmet or CRT

Question 11.4   For the interactions rated "somewhat different", is the difference enough to require a change in training methods?

New System_____LH-X_____

Question 12.1   In terms of training methods, how much difference
                will there be between the new system and the current
                systems it replaces? (Note that this differs from
                Questions 8.1 and 9.1, by emphasizing training
                difference instead of system operation differences,
                i.e., differences in system operation might not
                always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	C
12.1.2	Instrument Flying	B
12.1.3	Nap of Earth Flying	D
12.1.4	Navigation	C
12.1.5	Communications	B
12.1.6	Target Detection	B
12.1.7	Target Attack	A
12.1.8	Weapon Aiming and Firing . .	A
12.1.9	Air-to-Air Combat Flight Maneuvers	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	A
12.1.11	Multiple Aircraft Operations	C
12.1.12	Reconnaissance	C
12.1.13	Command and Control Information Processing	A
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
                what is the nature of the difference?

                12.1.7 - 12.1.10 Air-to-air training; air-to-ground suppression
                12.1.13 More information preprocessed

Question 12.3   For the training areas rated "substantially different",
                what is the nature of the difference?

                12.1.2 Adverse WX
                12.1.6 More wave - better, FLIR, Mast Mounted Sight

Question 12.4   For the training areas rated "somewhat different",
                what is the nature of the difference?

                12.1.2 Easier, map of earth at night
                12.1.4 Map display, PNVS

New System ___LH-X___

Question 12.4 (Continued)

> 12.1.5   *Much easier IX*
> 12.1.11 *More information preprocessed*
> 12.1.12 *(No information recorded)*

New System___SEMA-A_____

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	A
6.1.2 Instruments	A
6.1.3 Displays	A
6.1.4 Power Controls	A
6.1.5 Seating Arrangement	D
6.1.6 Visibility	D
6.1.7 Weapon Guidance	N/A
6.1.8 Guns	N/A
6.1.9 Rockets	N/A
6.1.10 Laser	N/A
6.1.11 Threat Detection	B
6.1.12 Navigation	A
6.1.13 Communication	A
6.1.14 ECM/EW	B
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

  6.1.1   Hover aircraft
  6.1.12 Multiplex
  6.1.13 Multiplex

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

  6.1.11 Maneuver avoidance

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System _____SEMA-X_____

Question 7.1   How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	A
7.1.2	Flight Stability	A
7.1.3	Control Responsiveness . .	A
7.1.4	Flying Workload	B
7.1.5	Flight Safety Characteristics	D
7.1.6	Complexity	A
7.1.7	Speed	A
7.1.8	Target Detection Capabilities	D
7.1.9	Weapon Range	N/A
7.1.10	Weapon Accuracy	N/A
7.1.11	Troop Capacity	N/A
7.1.12	Cargo Capacity	N/A
7.1.13	Other (Specify) . . VSTOL . .	B
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different", what is the nature of the difference?

7.1.1 More maneuverability   7.1.6 More complex
7.1.2 Full authority system   7.1.7 Higher speed (2)
7.1.3 More responsive

Question 7.3   For the performances rated "substantially different", what is the nature of the difference?

7.1.8 Technology update

Question 7.4   For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System   *SEMA-X*

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
                difference is there between the new system and
                the current systems which it replaces? (Degrees
                of difference are defined in Question 6.1).

Operation	Degree of Difference
8.1.1 Basic Flying	*C*
8.1.2 Instrument Flying	*C*
8.1.3 Nap of Earth Flying	*N/A*
8.1.4 Navigation	*B*
8.1.5 Communication	*C*
8.1.6 Other (Specify)	
8.1.7 Other (Specify)	

Question 8.2   For the operations rated "radically different", what
                is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
                what is the nature of the difference?

                8.1.4 Multiplex inertial

Question 8.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

                8.1.1 Transition training fixed wing training

New System   *SEMA-X*

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	N/A
9.1.3	Weapon Aiming and Firing . . .	N/A
9.1.4	Air-to-Air Combat Flight Maneuvers	N/A
9.1.5	Air-to-Ground Combat Flight Maneuvers	N/A
9.1.6	Multiple Aircraft Operation .	D
9.1.7	Reconnaissance	D
9.1.8	Command and Control Information Processing	A
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

A's are better

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System   *SEMA-X*

Question 10.1   What are the differences in <u>man-machine skill</u>
<u>requirements</u> between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	<u>Skill Category</u>	<u>Degree of Difference</u>
10.1.1	Monitoring Displays	*A*
10.1.2	Tracking Outside Aircraft . .	*D*
10.1.3	Recognition	*D*
10.1.4	Memory	*D*
10.1.5	Decision-Making	*B*
10.1.6	Physical Responses	*C*
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

10.1.1 Easier
10.1.5 Some off-loading of work tasks

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

10.1.6 Transition training

New System __SEMA-X__

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	D
11.1.2	Non-Verbal Exchange	D
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System   *SEMA-X*

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation differences</u>,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	B
12.1.2	Instrument Flying	D
12.1.3	Nap of Earth Flying	N/A
12.1.4	Navigation	C
12.1.5	Communications	C
12.1.6	Target Detection	D
12.1.7	Target Attack	N/A
12.1.8	Weapon Aiming and Firing . .	N/A
12.1.9	Air-to-Air Combat Flight Maneuvers	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	N/A
12.1.11	Multiple Aircraft Operations	D
12.1.12	Reconnaissance	D
12.1.13	Command and Control Information Processing	B
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

12.1.9 Threat detection followed by evasive maneuvers

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

12.1.1   Transition
12.1.13 Easier by preprocessing

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

12.1.3 Multiplex overall training easier

Question 13   As stated at the beginning of the questionnaire
               the objective of this study is to identify new Army
               aviation systems and system characteristics which
               will require behavioral changes necessitating new
               training techniques.

               Given this objective, is there anything further
               which you believe will require changes in training
               as a result of the introduction of new Army aviation
               systems?

               Advanced Scout Helicopter ROC describes LH-X

               LH-X = Far Term Scout

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE___*28 May 1980*___   QUESTIONNAIRE NO.___*3*___

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
               inventory for the period of 1985 to 2000 (within your
               area of cognizance)?

               1.1   *Advanced Scout Helicopter (ASH)*_____
               1.2   *Near Term Scout Helicopter*_____
               1.3   _____
               1.4   _____

Question 2   What are the probabilities that each of these new
               systems will be introduced into Army inventory?
               (Values of probability are defined as 1.0 = almost
               certain, 0.8 = highly probable, 0.6 = probable,
               0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	*Advanced Scout Helicopter*	*0.2 - 0.4*
2.2	*Near Term Scout Helicopter*	*0.8*
2.3		
2.4		

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Question 3   What are the scheduled years for introducing each of these new aviation systems?

	New System	Year
3.1	*Advanced Scout Helicopter*	*1993*
3.2	*Near Term Scout Helicopter*	*1985*
3.3		
3.4		

Question 4   How extensive will be the use of each of these new systems? (Degrees of use are defined as "a" = more than three thousand items, "b" = one to three thousand items, "c" = three hundred to one thousand items, "d" = one to three hundred items, and "e" = thirty to one hundred items.)

	New System	Degree of Use
4.1	*Advanced Scout Helicopter*	*C*
4.2	*Near Term Scout Helicopter*	*C*
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced by each of these systems?

	New Systems	Current Systems
5.1	*Advanced Scout Helicopter*	*Augmented AAH-64, COBRA (Near Term Scout Helicopter)*
5.2	*Near Term Scout Helicopter*	*OH-58A or C*
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on separate sheets, for each of the new systems identified in the answer to Question 1.

New System _Advanced Scout Helicopter_

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of physical characteristics? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	A
6.1.2 Instruments	A
6.1.3 Displays	A
6.1.4 Power Controls	C
6.1.5 Seating Arrangement	C
6.1.6 Visibility	D
6.1.7 Weapon Guidance	A
6.1.8 Guns	A
6.1.9 Rockets	A
6.1.10 Laser	A
6.1.11 Threat Detection	A
6.1.12 Navigation	A
6.1.13 Communication	A
6.1.14 ECM/EW	A
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?
6.1.1 Fiber optics for greater reliability
6.1.2 - 6.1.3 Electronic digital systems management, warning
indicators
(continued on attached)

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System   *Advanced Scout Helicopter*

Question 6.2 (continued)

> *6.1.7 Mast Mounted Sight*
> *6.1.9 Air-to-air, air-to-ground, and anti-tank missiles*
> *6.1.10 - 6.1.13 Same as Near Term Scout Helicopter but more*
> *detection devices such as acoustic sensors,*
> *advanced in techology*
> *6.1.4 Better jammers, more digital information without voice*
> *communication*

New System _Advanced Scout Helicopter_

Question 7.1   How much performance difference will there be
                between the new system and the current systems
                which it replaces? (Degrees of difference are
                defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	B
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	B
7.1.4	Flying Workload	A
7.1.5	Flight Safety Character- istics	B
7.1.6	Complexity	B
7.1.7	Speed	B
7.1.8	Target Detection Capa- bilities	A
7.1.9	Weapon Range	A
7.1.10	Weapon Accuracy	A
7.1.11	Troop Capacity	N/A
7.1.12	Cargo Capacity	N/A
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
                what is the nature of the difference?

                7.1.4 Employ of hover-hold and work-saving devices
                7.1.8 - 7.1.10   The range, type and make-up of sensors such as
                _   FLIR, acoustic, new generation of sensors_

Question 7.3   For the performances rated "substantially different",
                what is the nature of the difference?
                7.1.1 - 7.1.3 New aircraft, twin engines, built for role, new
                _   design parameters_
                7.1.5 Crashworthy, survivability, better armament, and fly by
                _   light fiber optics_
                7.1.6 More black boxes   7.1.7 Faster

Question 7.4   For the performances rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.

New System _Advanced Scout Helicopter_

Question 8.1   In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces?   (Degrees
of difference are defined in Question 6.1).

Operation	Degree of Difference
8.1.1 Basic Flying	_D_
8.1.2 Instrument Flying	_C_
8.1.3 Nap of Earth Flying	_B_
8.1.4 Navigation	_B_
8.1.5 Communication _devices)_	_B_
8.1.6 Other (Specify)	
8.1.7 Other (Specify)	

(much simpler digitalized devices)

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

_8.1.3 - 8.1.4   PMD, DOPPLER, IACS, GPS, PLR automatically
update positions_
8.1.5   Digital capabilities and data bus

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods?   If so, indicate the nature of
the difference.

8.1.2   A lot easier

New System _Advanced Scout Helicopter_

Question 9.1   In terms of combat operations tasks, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	A
9.1.3	Weapon Aiming and Firing . . .	A
9.1.4	Air-to-Air Combat Flight Maneuvers	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	A
9.1.6	Multiple Aircraft Operation .	A
9.1.7	Reconnaissance	A
9.1.8	Command and Control Information Processing	A
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

_Due to sensor capabilities, tactical acquisition, cuing,
video recording, and use of mast mounted sight, target
laser, requires coordination of gunship activities._

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System _Advanced Scout Helicopter_

Question 10.1 What are the differences in man-machine skill
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	A
10.1.2	Tracking Outside Aircraft . .	A
10.1.3	Recognition	C
10.1.4	Memory	D
10.1.5	Decision-Making	D
10.1.6	Physical Responses	D
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2 For the skills rated "radically different", what is
the nature of the difference?

10.1.1 Digital electronic devices
10.1.2 Pilot night vision system versus night vision goggle

Question 10.3 For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4 For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

10.1.3 CRT display

New System _Advanced Scout Helicopter_

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	<u>Interaction Category</u>	<u>Degree of Difference</u>
11.1.1	Verbal Exchange	_D_
11.1.2	Non-Verbal Exchange	_D_
11.1.3	Coordinated Physical Responses	_D_
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System *Advanced Scout Helicopter*

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

Training Areas	Degree of Difference
12.1.1 Basic Flying	A
12.1.2 Instrument Flying	C
12.1.3 Nap of Earth Flying	C
12.1.4 Navigation	C
12.1.5 Communications	C
12.1.6 Target Detection	A
12.1.7 Target Attack	A
12.1.8 Weapon Aiming and Firing . .	A
12.1.9 Air-to-Air Combat Flight Maneuvers	A
12.1.10 Air-to-Ground Combat Flight Maneuvers	A
12.1.11 Multiple Aircraft Operations	C
12.1.12 Reconnaissance	A
12.1.13 Command and Control Information Processing	A
12.1.14 Other (Specify)	
12.1.15 Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

12.1.1 HUD and PNVS
*12.1.6 - 12.1. 10 Mast mounted system, sensor capabilities,
information processing capabilities,
(continued on attached)*

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

12.1.2 Digital equipment
12.1.3 Aircraft system is much easier to fly
(continued on attached)

New System *Advanced Scout Helicopter*

Question 12.2 (Continued)

> *12.1.10 computer, new weapon systems*
> *12.1.12 Mast mounted system, video recorder*
> *12.1.13 Better communication and data handling*

Question 12.4 (Continued)

> *12.1.4 Projected map display, Doppler*
> *12.1.5 Multifrequency model*
> *12.1.11 Coordinate gunships*

New System _Near Term Scout Helicopter_

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

<u>Component</u>		<u>Degree of Difference</u>
6.1.1	Flight Controls	D
6.1.2	Instruments	D
6.1.3	Displays	A
6.1.4	Power Controls	D
6.1.5	Seating Arrangement	D
6.1.6	Visibility	D
6.1.7	Weapon Guidance	C
6.1.8	Guns	C
6.1.9	Rockets	C
6.1.10	Laser	B
6.1.11	Threat Detection	B
6.1.12	Navigation	C
6.1.13	Communication	C
6.1.14	ECM/EW	C
6.1.15	Other (Specify) _FLIR (night vision)_	C
6.1.16	Other (Specify) _FLIR (night TAS)_	B

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

   6.1.3 Feature of CRT, tracker, cuing, laser

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

   6.1.10 New application for range designation and target location
   6.1.11 Mast mounted sight, FLIR, LLTV, laser
   6.1.16 FLIR on night target acquisition

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

   6.1.7 - 6.1.9 Air-to-air missile and fire and forget
   6.1.12 & 6.1.14 Mast mounted sight
   6.1.13 Better radio communication equipment
   6.1.15 FLIR night vision

New System _Near Term Scout Helicopter_

Question 7.1   How much performance difference will there be
                between the new system and the current systems
                which it replaces? (Degrees of difference are
                defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	D
7.1.2	Flight Stability	D
7.1.3	Control Responsiveness	D
7.1.4	Flying Workload	B(1-pilot) C(2-pilot)
7.1.5	Flight Safety Characteristics	D
7.1.6	Complexity	C
7.1.7	Speed	D
7.1.8	Target Detection Capabilities	B
7.1.9	Weapon Range	B
7.1.10	Weapon Accuracy	B
7.1.11	Troop Capacity	N/A
7.1.12	Cargo Capacity	N/A
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
                what is the nature of the difference?

Question 7.3   For the performances rated "substantially different",
                what is the nature of the difference?
       _7.1.4 Increase workload because of additional capabilities
           under different conditions_
       7.1.8 Use of TV and FLIR systems allowing target picture enlargement
       7.1.9 - 7.1.10 New capabilities

Question 7.4   For the performances rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.
       7.1.6 More missions

New System _Near Term Scout Helicopter_

Question 8.1   In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	D
8.1.2	Instrument Flying	D
8.1.3	Nap of Earth Flying	D
8.1.4	Navigation	C
8.1.5	Communication	C
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

8.1.4 Projected map display and DOPPLER
8.1.5 Better communication to NOE and multifunction radios

New System _Near Term Scout Helicopter_

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	_A_
9.1.2	Target Attack	_A_
9.1.3	Weapon Aiming and Firing . . .	_A_
9.1.4	Air-to-Air Combat Flight Maneuvers	_A_
9.1.5	Air-to-Ground Combat Flight Maneuvers	_A_
9.1.6	Multiple Aircraft Operation .	_B_
9.1.7	Reconnaissance	_B_
9.1.8	Command and Control Information Processing	_B_
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

    *9.1.1 - 9.1.3 New systems allow helicopters to hop behind bridges
              and buildings. New capabilities of using CRT.*
    9.1.4 New tactics - self defénse and protecting attack helicopters
    9.1.5 Employ air-to-ground defense suppression weapons

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?
    9.1.6 A function of tactics and mission scenarios
    9.1.7 Mast mounted sight and video recording systems
    *9.1.8 Provide greater location accuracy to ground commanders.
          This presents more workload for scout helicopter.*

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System   *Near TErm Scout Helicopter*

Question 10.1   What are the differences in man-machine skill
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

Skill Category	Degree of Difference
	B(Pilot)
10.1.1 Monitoring Displays	A(Observer)
10.1.2 Tracking Outside Aircraft . .	D
10.1.3 Recognition	C
10.1.4 Memory	B
10.1.5 Decision-Making	C(Pilot)
	B(Observer)
10.1.6 Physical Responses	C
10.1.7 Other (Specify)	
10.1.8 Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

10.1.1 CRT inputs and outputs are new

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

*10.1.4 More demand on observer (intelligent and bright
persons required)*
10.1.5 Systems have a marked impact on observer's workload

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

10.1.3 Using CRT display instead of binoculars
10.1.6 Due to new electronic devices

New System _Near Term Scout Helicopter_

Question 11.1   What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	B
11.1.2	Non-Verbal Exchange	D
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2   For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
what is the nature of the difference?

> _11.1.1   Mast mounted sight (pilot works from two field references -
> CRT and visual)._

Question 11.4   For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System _Near Term Scout Helicopter_

Question 12.1   In terms of <u>training methods</u>, how much difference
                 will there be between the new system and the current
                 systems it replaces? (Note that this differs from
                 Questions 8.1 and 9.1, by emphasizing <u>training</u>
                 difference instead of <u>system operation differences</u>,
                 i.e., differences in system operation might <u>not</u>
                 always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	D
12.1.2	Instrument Flying	C
12.1.3	Nap of Earth Flying	C
12.1.4	Navigation	C
12.1.5	Communications	C
12.1.6	Target Detection	B
12.1.7	Target Attack	B
12.1.8	Weapon Aiming and Firing . .	B
12.1.9	Air-to-Air Combat Flight Maneuvers	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	A
12.1.11	Multiple Aircraft Operations	C
12.1.12	Reconnaissance	B
12.1.13	Command and Control Information Processing	C
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
                 what is the nature of the difference?

                 12.1.9 - 12.1.10 New concept and tactics, Mast Mounted Sight

Question 12.3   For the training areas rated "substantially different",
                 what is the nature of the difference?

                 12.1.6 - 12.1.8 Mast Mounted Sight and air-to-air capabilities
                 12.1.12 Mast Mounted Sight

Question 12.4   For the training areas rated "somewhat different",
                 what is the nature of the difference?

                 12.1.2 - 12.1.4 DOPPLER and projected map display
                 12.1.5 More secure and multi-function radios
                         (continued on attached)

New System _Near Term Scout Helicopter_

Question 12.4 (Continued)

> _12.1.11 Coordinate gunships and relief of aircraft on station_
> _12.1.13 Due to the nature of avionics installed in the aircraft (better equipment, more secure)_

Question 13   As stated at the beginning of the questionnaire
the objective of this study is to identify new Army
aviation systems and system characteristics which
will require behavioral changes necessitating new
training techniques.

Given this objective, is there anything further
which you believe will require changes in training
as a result of the introduction of new Army aviation
systems?

1. *Need to emphasize man-machine interface and crew
   coordination issues.*
2. *Target acquisition, target designation, air-to-air combat
   are new missions.*
3. *Observers requir' the same type of training as pilots.*
4. *Maintenance aspects have to be addressed. Will need higher
   skill level and better trained personnel.*
5. *Crew needs to deal with electronic displays and advisory
   devices, coordinate night battle conditions.*
6. *Need to discriminate against color and voice symbology in
   Advanced Scout Helicopter.*

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE _28 May 1980_   QUESTIONNAIRE NO. ___4___

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
inventory for the period of 1985 to 2000 (within your
area of cognizance)?

1.1	_Black Hawk (SOTAS, Hellfire, GPS)_
1.2	_Black Hawk with SOTAS_
1.3	_Black Hawk with Hellfire Missile_
1.4	_Black Hawk with GPS_

Question 2   What are the probabilities that each of these new
systems will be introduced into Army inventory?
(Values of probability are defined as 1.0 = almost
certain, 0.8 = highly probable, 0.6 = probable,
0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	_Black Hawk_	_1.0_
2.2	_Black Hawk with SOTAS_	_1.0_
2.3	_Black Hawk with Hellfire Missile_	_1.0_
2.4	_Black Hawk with GPS_	_1.0_

Question 3   What are the scheduled years for introducing each of these new aviation systems?

	New System	Year
3.1	*Black Hawk*	*1979*
3.2	*Black Hawk with SOTAS*	*?*
3.3	*Black Hawk with Hellfire Missile*	*?*
3.4	*Black Hawk with GPS*	*1985*

Question 4   How extensive will be the use of each of these new systems? (Degrees of use are defined as "a" = more than three thousand items, "b" = one to three thousand items, "c" = three hundred to one thousand items, "d" = one to three hundred items, and "e" = thirty to one hundred items.)

	New System	Degree of Use
4.1	*Black Hawk*	*B (but are not all funded)*
4.2	*Black Hawk with SOTAS*	*D or E*
4.3	*Black Hawk with Hellfire Missile*	*?*
4.4	*Black Hawk with GPS*	*? (mainly for medical evacuation aircraft)*

Question 5   What are the current systems, if any, to be replaced by each of these systems?

	New Systems	Current Systems
		(maintain a ratio of
5.1	*Black Hawk*	*UH-1 15BH/23UH-1)*
5.2	*Black Hawk with SOTAS*	*new*
5.3	*Black Hawk with Hellfire Missile*	*new*
5.4	*Black Hawk with GPS*	*existing navigation system*

The questionnaire responder should answer Questions 6 to 12, on separate sheets, for each of the new systems identified in the answer to Question 1.

New System *Black Hawk (SOTAS, Hellfire Missile, GPS)*

Question 6.1   How much difference will there be between the new
                system and the current systems which it replaces
                in terms of <u>physical characteristics</u>? (Degrees of
                difference are defined as: "a" = radically different;
                "b" = substantially different; "c" = somewhat
                different; and "d" = minimal or no difference.)

	<u>Component</u>	<u>Degree of Difference</u>
6.1.1	Flight Controls	B
6.1.2	Instruments	B
6.1.3	Displays	B
6.1.4	Power Controls	B
6.1.5	Seating Arrangement	D
6.1.6	Visibility	C
6.1.7	Weapon Guidance	B
6.1.8	Guns	B
6.1.9	Rockets	B
6.1.10	Laser	B
6.1.11	Threat Detection	B
6.1.12	Navigation	B
6.1.13	Communication	B
6.1.14	ECM/EW	B
6.1.15	Other (Specify) *Tilt Rotor(SB-15)*	B
6.1.16	Other (Specify) *Advanced Blade Concept*	B

Question 6.2   For the components rated "radically different", what
                is the nature of the difference?

Question 6.3   For the components rated "substantially different",
                what is the nature of the difference?

   6.1.1 - 6.1.4 Less weight, more reliable, state-of-art
                   improvement
   6.1.6 Improve small display panel (continued on attached)

Question 6.4   For the components rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.

New System _Black Hawk (SOTAS, Hellfire Missile, GPS)_

Question 6.3 (Continued)

> 6.1.7 - 6.1.14 _New technology_
> 6.1.15 _Tilt rotor_
> 6.1.16 _More flexible, low speed and fixed wing and ability to hop like helicopters_

New System _Black Hawk (SOTAS, Hellfire Missile, GPS)_

Question 7.1   How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	B
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	B
7.1.4	Flying Workload	B
7.1.5	Flight Safety Characteristics	D
7.1.6	Complexity	B
7.1.7	Speed	B
7.1.8	Target Detection Capabilities	B
7.1.9	Weapon Range	B
7.1.10	Weapon Accuracy	B
7.1.11	Troop Capacity	D
7.1.12	Cargo Capacity	C
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different", what is the nature of the difference?

Question 7.3   For the performances rated "substantially different", what is the nature of the difference?

7.1.1 - 7.1.3 Less weight, friction-free, state-of-art
7.1.4 50 percent reduction in workload (but will introduce additional functions for DOPPLER and GPS capabilities) (continued on attached)

Question 7.4   For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

7.1.12 Dimensions are the same, but can carry more weight

New System *Black Hawk (SOTAS, Hellfire Missile, GPS)*

Question 7.3 (Continued)

> *7.1.6 More complex*
> *7.1.7 Higher speed*
> *7.1.8 Digital display*
> *7.1.9 Use of rockets*
> *7.1.10 New sighting device and laser ranging*

New System _Black Hawk (SOTAS, Hellfire Missile, GPS)_

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
                difference is there between the new system and
                the current systems which it replaces? (Degrees
                of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	_B_
8.1.2	Instrument Flying	_B_
8.1.3	Nap of Earth Flying	_D_
8.1.4	Navigation	_B_
8.1.5	Communication	_D_
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
                is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
                what is the nature of the difference?

_8.1.1 Functions are the same but characteristics are different
         due to side arm for stick control_
_8.1.2 Use of CRT, digital readouts, and automatic for IFR
         (Instrument Flight Rules)_
8.1.4 Simplified by GPS and DOPPLER

Question 8.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

New System _Black Hawk (SOTAS, Hellfire Missile, GPS)_

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	B
9.1.2	Target Attack	B
9.1.3	Weapon Aiming and Firing . . .	B
9.1.4	Air-to-Air Combat Flight Maneuvers	D
9.1.5	Air-to-Ground Combat Flight Maneuvers	C
9.1.6	Multiple Aircraft Operation .	B
9.1.7	Reconnaissance	B
9.1.8	Command and Control Information Processing	B
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?
9.1.1 - 9.1.2 Army digital aircraft systems
9.1.3 HUD (better sighting and tracking equipment)
_9.1.6 Improve rendezvous capability when operating with other
aircraft because of GPS_
9.1.7 SOTAS and GPS   9.1.8 SOTAS

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

9.1.5 Different equipment, more maneuver

New System Black Hawk (SOTAS, Hellfire Missile, GPS)

Question 10.1   What are the differences in man-machine skill requirements between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	B
10.1.2	Tracking Outside Aircraft . .	D
10.1.3	Recognition	C
10.1.4	Memory	D
10.1.5	Decision-Making	D
10.1.6	Physical Responses	B
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

10.1.1 Digital and CRT equipment
10.1.6 Side arm control (fire with one hand, other hand and feet are free)

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

10.1.3 Use of sensors (FLIR, IR)

New System Black Hawk (SOTAS, Hellfire, GPS)

Question 11.1   What are the differences in crew interaction
                 requirements between the new system and the current
                 systems which it replaces? (Degrees of difference
                 are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	D
11.1.2	Non-Verbal Exchange	B
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2   For the interactions rated "radically different",
                 what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
                 what is the nature of the difference?
    11.1.2   During air-to-air engagement

Question 11.4   For the interactions rated "somewhat different",
                 is the difference enough to require a change in
                 training methods?

New System_Black Hawk (SOTAS, Hellfire Missile, GPS)_

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

	<u>Training Areas</u>	<u>Degree of Difference</u>
12.1.1	Basic Flying	_D_
12.1.2	Instrument Flying	_C_
12.1.3	Nap of Earth Flying	_D_
12.1.4	Navigation	_D_
12.1.5	Communications	_D_
12.1.6	Target Detection	_B_
12.1.7	Target Attack	_B_
12.1.8	Weapon Aiming and Firing . .	_B_
12.1.9	Air-to-Air Combat Flight Maneuvers	_B_
12.1.10	Air-to-Ground Combat Flight Maneuvers	_B_
12.1.11	Multiple Aircraft Operations	_B_
12.1.12	Reconnaissance	_B_
12.1.13	Command and Control Information Processing	_B_
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?
_12.1.6 - 12.1.11 Better equipment (more training required to
understand systems which provide information to
support these tasks)_
12.1.12 - 12.1.13 SOTAS and GPS

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

12.1.2 Basic knowledge of instrument systems

Question 13   As stated at the beginning of the questionnaire
               the objective of this study is to identify new Army
               aviation systems and system characteristics which
               will require behavioral changes necessitating new
               training techniques.

               Given this objective, is there anything further
               which you believe will require changes in training
               as a result of the introduction of new Army aviation
               systems?

               *A lot of training required to teach people systems in the air-
               craft. The training has to be more complete and more information
               provided. More aircraft systems in Black Hawk than UH-1 plus the
               addition of large amount of digital systems.*

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE __27 May 1980__   QUESTIONNAIRE NO. ____5____

RESPONDER'S NAME _____

RESPONDER'S ORGANIZATION _____

RESPONDER'S TITLE OR POSITION _____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
               inventory for the period of 1985 to 2000 (within your
               area of cognizance)?

               1.1 _Aircraft Rocket Systems_____

               1.2 _Aircraft Guns (20mm, 30mm)_____

               1.3 _Fire Control (Mast Mounted Sight, FLIR)___

               1.4 _____

Question 2   What are the probabilities that each of these new
               systems will be introduced into Army inventory?
               (Values of probability are defined as 1.0 = almost
               certain, 0.8 = highly probable, 0.6 = probable,
               0.4 = uncertain, and 0.2 = highly unlikely.)

                        New System   Probability

               2.1 _Aircraft Rocket Systems_   __0.75 (see attached)_

               2.2 _Aircraft Guns_____   ____0.60_____

               2.3 _Fire Control_____   ___0.70_____

               2.4 _____   _____

Question 2 (Continued)

Aircraft Rocket Systems include:

    a. Multiple purpose submunition with $p = 1.0$

    b. Lightweight launcher with $p = 1.0$

    c. Rocket motor development with $p = 1.0$

    d. Smoke screen warhead with $p = 0.5$

    e. Illumination warhead with $p = 0.5$

IOC for a, b, and c is 1983.
IOC for d, e is 1985.

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
3.1	*Aircraft Rocket Systems*	*1981-1985*
3.2	*Aircraft Guns*	*1987*
3.3	*Fire Control*	*1987*
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	*Aircraft Rocket Systems*	*A*
4.2	*Aircraft Guns*	*B*
4.3	*Fire Control*	*C*
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1	*Aircraft Rocket Systems*	*(see attached)*
5.2	*Aircraft Guns*	*20mm in COBRA; .30mm in AH*
5.3	*Fire Control*	
5.4		

The questionnaire responder should answer Questions 6 to 12, on
separate sheets, for each of the new systems identified in the
answer to Question 1.

QUESTION 5 (Continued)

Multiple purpose submunition is completely new.

Lightweight launcher replaces M200 and M158.

Rocket motor replaced MK40.

Smoke screen warhead replaces M262.

Illumination warhead replaces M157.

New System _Aircraft Rocket Systems_____

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	
6.1.2 Instruments	
6.1.3 Displays	_D_
6.1.4 Power Controls	
6.1.5 Seating Arrangement	
6.1.6 Visibility	
6.1.7 Weapon Guidance	_N/A_
6.1.8 Guns	_D_
6.1.9 Rockets	_C_
6.1.10 Laser	_D_
6.1.11 Threat Detection	
6.1.12 Navigation	
6.1.13 Communication	
6.1.14 ECM/EW	
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

6.1.9 _More accurate and longer range_

New System _Aircraft Rocket Systems_

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	_____
7.1.2	Flight Stability	_____
7.1.3	Control Responsiveness . .	_____
7.1.4	Flying Workload	_____
7.1.5	Flight Safety Character-istics	_____
7.1.6	Complexity	_____
7.1.7	Speed	_____
7.1.8	Target Detection Capa-bilities	_____
7.1.9	Weapon Range	_B_
7.1.10	Weapon Accuracy	_B_
7.1.11	Troop Capacity	_____
7.1.12	Cargo Capacity	_____
7.1.13	Other (Specify)	_____
7.1.14	Other (Specify)	_____

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

7.1.9   50 percent increase in range
7.1.10 More accurate

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System _Aircraft Rocket Systems_

Question 8.1   In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	D
8.1.2	Instrument Flying	D
8.1.3	Nap of Earth Flying	D
8.1.4	Navigation	D
8.1.5	Communication	D
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System *Aircraft Rocket Systems*

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	
9.1.2	Target Attack	B
9.1.3	Weapon Aiming and Firing . . .	B
9.1.4	Air-to-Air Combat Flight Maneuvers	-
9.1.5	Air-to-Ground Combat Flight Maneuvers	D
9.1.6	Multiple Aircraft Operation .	D
9.1.7	Reconnaissance	-
9.1.8	Command and Control Information Processing	-
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

9.1.2 Area weapon capability is increased
9.1.3 More accurate and easier to aim

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System   *Aircraft Rocket Systems*

Question 10.1   What are the differences in <u>man-machine skill</u>
<u>requirements</u> between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	D
10.1.2	Tracking Outside Aircraft . .	D
10.1.3	Recognition	D
10.1.4	Memory	-
10.1.5	Decision-Making	C
10.1.6	Physical Responses	
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

*10.1.5 Pilot could get range information from laser thus
eliminating some pilot's decision-making requirement*

New System *Aircraft Rocket Systems*

Question 11.1 What are the differences in crew interaction requirements between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	D
11.1.2	Non-Verbal Exchange	D
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different", what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different", what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different", is the difference enough to require a change in training methods?

New System *Aircraft Rocket Systems*

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	
12.1.2	Instrument Flying	
12.1.3	Nap of Earth Flying	
12.1.4	Navigation	
12.1.5	Communications	
12.1.6	Target Detection	
12.1.7	Target Attack	
12.1.8	Weapon Aiming and Firing . .	*C*
12.1.9	Air-to-Air Combat Flight Maneuvers	
12.1.10	Air-to-Ground Combat Flight Maneuvers	
12.1.11	Multiple Aircraft Operations	
12.1.12	Reconnaissance	*D*
12.1.13	Command and Control Information Processing	
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

12.1.8 New system

New System   *Aircraft Guns*

Question 6.1   How much difference will there be between the new
                system and the current systems which it replaces
                in terms of <u>physical characteristics</u>? (Degrees of
                difference are defined as: "a" = radically different;
                "b" = substantially different; "c" = somewhat
                different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	
6.1.2 Instruments	
6.1.3 Displays	
6.1.4 Power Controls	
6.1.5 Seating Arrangement	
6.1.6 Visibility	
6.1.7 Weapon Guidance	
6.1.8 Guns	*B*
6.1.9 Rockets	
6.1.10 Laser	
6.1.11 Threat Detection	
6.1.12 Navigation	
6.1.13 Communication	
6.1.14 ECM/EW	
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
                is the nature of the difference?

Question 6.3   For the components rated "substantially different",
                what is the nature of the difference?

                6.1.8 Differences in drive, feed systems and ammunition

Question 6.4   For the components rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.

New System *Aircraft Guns*

Question 7.1   How much performance difference will there be
                between the new system and the current systems
                which it replaces? (Degrees of difference are
                defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	
7.1.2	Flight Stability	
7.1.3	Control Responsiveness . .	
7.1.4	Flying Workload	
7.1.5	Flight Safety Character-istics	
7.1.6	Complexity	
7.1.7	Speed	
7.1.8	Target Detection Capa-bilities	
7.1.9	Weapon Range	*C*
7.1.10	Weapon Accuracy	*B*
7.1.11	Troop Capacity	
7.1.12	Cargo Capacity	
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
                what is the nature of the difference?

Question 7.3   For the performances rated "substantially different",
                what is the nature of the difference?

                7.1.10 Better pointing accuracy

Question 7.4   For the performances rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.

                7.1.9 Greater range

New System __*Aircraft Guns*__

Question 8.1 In terms of cockpit crew operations, how much difference is there between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Operation	Degree of Difference
8.1.1 Basic Flying	_D_
8.1.2 Instrument Flying	_D_
8.1.3 Nap of Earth Flying	_D_
8.1.4 Navigation	_D_
8.1.5 Communication	_D_
8.1.6 Other (Specify)	___
8.1.7 Other (Specify)	___

Question 8.2 For the operations rated "radically different", what is the nature of the difference?

Question 8.3 For the operations rated "substantially different", what is the nature of the difference?

Question 8.4 For the operations rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System   *Aircraft Guns*

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	<u>Operation</u>	<u>Degree of Difference</u>
9.1.1	Target Detection	
9.1.2	Target Attack	
9.1.3	Weapon Aiming and Firing . . .	
9.1.4	Air-to-Air Combat Flight Maneuvers	*A*
9.1.5	Air-to-Ground Combat Flight Maneuvers	
9.1.6	Multiple Aircraft Operation .	
9.1.7	Reconnaissance	
9.1.8	Command and Control Information Processing	
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

> *9.1.4 New additional capabilities for attack and*
> *scout helicopters (heavier ammo)*

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System *Aircraft Guns*

Question 10.1   What are the differences in man-machine skill requirements between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	D
10.1.2	Tracking Outside Aircraft . .	A
10.1.3	Recognition	B
10.1.4	Memory	D
10.1.5	Decision-Making	C
10.1.6	Physical Responses	D
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

10.1.2 Due to air-to-air capabilities

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

10.1.3 Due to increase in range and accuracy

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System __Aircraft Guns__

Question 11.1   What are the differences in <u>crew interaction</u>
                 requirements between the new system and the current
                 systems which it replaces? (Degrees of difference
                 are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	B
11.1.2	Non-Verbal Exchange	B
11.1.3	Coordinated Physical Responses	B
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2   For the interactions rated "radically different",
                 what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
                 what is the nature of the difference?

                 All due to air-to-air capabilities

Question 11.4   For the interactions rated "somewhat different",
                 is the difference enough to require a change in
                 training methods?

New System _Aircraft Guns_

Question 12.1   In terms of <u>training methods</u>, how much difference will there be between the new system and the current systems it replaces? (Note that this differs from Questions 8.1 and 9.1, by emphasizing <u>training</u> difference instead of <u>system operation differences</u>, i.e., differences in system operation might <u>not</u> always necessitate differences in training me<u>tho</u>ds.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	D
12.1.2	Instrument Flying	
12.1.3	Nap of Earth Flying	
12.1.4	Navigation	
12.1.5	Communications	
12.1.6	Target Detection	B
12.1.7	Target Attack	B
12.1.8	Weapon Aiming and Firing . .	B
12.1.9	Air-to-Air Combat Flight Maneuvers	B
12.1.10	Air-to-Ground Combat Flight Maneuvers	C
12.1.11	Multiple Aircraft Operations	D
12.1.12	Reconnaissance	D
12.1.13	Command and Control Information Processing	C
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different", what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different", what is the nature of the difference?

    12.1.6 - 12.1.9 Due to air-to-air capabilities

Question 12.4   For the training areas rated "somewhat different", what is the nature of the difference?

    12.1.13 Need to process information in terms of air-to-air defense capabilities

New System _Fire Control_

Question 6.1 How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	D
6.1.2 Instruments	D
6.1.3 Displays	D
6.1.4 Power Controls	D
6.1.5 Seating Arrangement	D
6.1.6 Visibility	A
6.1.7 Weapon Guidance	D
6.1.8 Guns	D
6.1.9 Rockets	D
6.1.10 Laser	D
6.1.11 Threat Detection	A
6.1.12 Navigation	D
6.1.13 Communication	D
6.1.14 ECM/EW	D
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2 For the components rated "radically different", what
is the nature of the difference?

6.1.6 and 6.1.11 New capability due to mast mounted sight

Question 6.3 For the components rated "substantially different",
what is the nature of the difference?

Question 6.4 For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System *Fire Control*

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	
7.1.2	Flight Stability	
7.1.3	Control Responsiveness . .	
7.1.4	Flying Workload	D
7.1.5	Flight Safety Character- istics	C
7.1.6	Complexity	B
7.1.7	Speed	
7.1.8	Target Detection Capa- bilities	A
7.1.9	Weapon Range	
7.1.10	Weapon Accuracy	
7.1.11	Troop Capacity	
7.1.12	Cargo Capacity	
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

7.1.8 Due to mast mounted sight

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

7.1.6 More difficult in maintenance and increasing workload

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

7.1.5 Due to the increased weight of mast mounted sight in shaft

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New System _Fire Control_

Question 8.1   In terms of cockpit crew operations, how much
              difference is there between the new system and
              the current systems which it replaces? (Degrees
              of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	_____
8.1.2	Instrument Flying	_____
8.1.3	Nap of Earth Flying	_D_
8.1.4	Navigation	_D_
8.1.5	Communication	_____
8.1.6	Other (Specify) _Survivability_ . .	_A_
8.1.7	Other (Specify) _Target Detection_	_B_

Question 8.2   For the operations rated "radically different", what
              is the nature of the difference?

              8.1.6 Increase survivability (due to MMS)

Question 8.3   For the operations rated "substantially different",
              what is the nature of the difference?

              8.1.7 Target detection due to MMS

Question 8.4   For the operations rated "somewhat different", is
              the difference enough to require a change in
              training methods? If so, indicate the nature of
              the difference.

New System_ _Fire Control_____

Question 9.1   In terms of combat operations tasks, how much
                difference is there between the new system and
                current systems which it replaces? (Degrees of
                difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	A
9.1.3	Weapon Aiming and Firing . . .	A
9.1.4	Air-to-Air Combat Flight Maneuvers	C
9.1.5	Air-to-Ground Combat Flight Maneuvers	B
9.1.6	Multiple Aircraft Operation .	D
9.1.7	Reconnaissance	A
9.1.8	Command and Control Information Processing	C
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
                is the nature of the difference?

                9.1.1 - 9.1.3 Mast mounted sight allows masking of aircraft
                9.1.7   Be able to see without exposure (MMS)

Question 9.3   For the operations rated "substantially different",
                what is the nature of the difference?

                9.1.5 Depends on terrain

Question 9.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

                9.1.4 Enhance air-to-air combat capabilities
                9.1.8 Greater coordination required between friendly aircraft

New System _Fire Control_

Question 10.1   What are the differences in <u>man-machine skill</u>
<u>requirements</u> between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	<u>Skill Category</u>	<u>Degree of Difference</u>
10.1.1	Monitoring Displays	D
10.1.2	Tracking Outside Aircraft . .	D
10.1.3	Recognition	D
10.1.4	Memory	D
10.1.5	Decision-Making	D
10.1.6	Physical Responses	D
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

New System _Fire Control_

Question 11.1   What are the differences in crew interaction
                requirements between the new system and the current
                systems which it replaces? (Degrees of difference
                are defined in Question 6.1).

                    Interaction Category   Degree of Difference

            11.1.1   Verbal Exchange . . . .   _____D_____

            11.1.2   Non-Verbal Exchange . . . . .   _____D_____

            11.1.3   Coordinated Physical
                     Responses . . . .   _____D_____

            11.1.4   Other (Specify) . . . .   _____

            11.1.5   Other (Specify) . . . .   _____

Question 11.2   For the interactions rated "radically different",
                what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
                what is the nature of the difference?

Question 11.4   For the interactions rated "somewhat different",
                is the difference enough to require a change in
                training methods?

New System___Fire Control___

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	_D_
12.1.2	Instrument Flying	_D_
12.1.3	Nap of Earth Flying	_D_
12.1.4	Navigation	_D_
12.1.5	Communications	_D_
12.1.6	Target Detection	_D_
12.1.7	Target Attack	_D_
12.1.8	Weapon Aiming and Firing . .	_D_
12.1.9	Air-to-Air Combat Flight Maneuvers	_D_
12.1.10	Air-to-Ground Combat Flight Maneuvers	_D_
12.1.11	Multiple Aircraft Operations	_D_
12.1.12	Reconnaissance	_D_
12.1.13	Command and Control Information Processing	_D_
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

Question 13   As stated at the beginning of the questionnaire
              the objective of this study is to identify new Army
              aviation systems and system characteristics which
              will require behavioral changes necessitating new
              training techniques.

              Given this objective, is there anything further
              which you believe will require changes in training
              as a result of the introduction of new Army aviation
              systems?

              RPV training may be an area to look at

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE _27 May 1980_   QUESTIONNAIRE NO. ____6____

RESPONDER'S NAME _____

RESPONDER'S ORGANIZATION _____

RESPONDER'S TITLE OR POSITION _____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
              inventory for the period of 1985 to 2000 (within your
              area of cognizance)?

              1.1   _ADAS (Army Digital Avionic Systems) - 3 generations_

              1.2   _Landing Systems (mini, microwave landing system, self-contained_

              1.3   _Air Traffic Control_   landing system)

              1.4   _(ICNI; TDMS)_

Question 2   What are the probabilities that each of these new
              systems will be introduced into Army inventory?
              (Values of probability are defined as 1.0 = almost
              certain, 0.8 = highly probable, 0.6 = probable,
              0.4 = uncertain, and 0.2 = highly unlikely.)

                     New System   Probability
                                             0.8 for 1st generation
              2.1   _ADAS_   _0.7 for 2nd and 3rd generations_

              2.2   _Landing Systems_   _Not determined (0.7 for our_ own

              2.3   _Air Traffic Control_   _?_   guessing value

              2.4   _____   _____

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QUESTION 2 (Continued)

1st generation of ADAS includes: (1) IACS (Integrated Avionic Control System), with P = 0.8; (2) AMD (Advanced Map Display) with P = 0.8; (3) Doppler with P = 0.9; (4) NNPS (Night Navigation Pilot Systems) with P = 0.7; (5) ADTS/TH (Airborne Data Transfer System/Target Hand-Off) with P = 0.7.

2nd generation of ADAS includes: (1) EMMADS (Electronic Master Monitor Advisory Display) with P = 0.1 - 0.9; (2) Advanced Audio Systems with P = 0.6; (3) Integrated Multi-Function Display (FLIR, LLTV) with P = 0.6; (4) Solid-State Programmable Multi-Format Display with P = 0.7; (5) Wire and Wire-like Optical Detect System (CO_2) with P = 0.7.

3rd generation of ADAS will integrate Fire Control, Flight Control, and EW landing systems to achieve night and all weather NOE capabilities, P = 0.7.

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
		1986-90 (1st gen.) 1995-2000
3.1	*ADAS*	*1990-95 (2nd gen.) (3rd gen.)*
3.2	*Landing Systems*	*1993-1995*
3.3	*Air Traffic Control*	*1993-1997*
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	*ADAS*	*A or B*
4.2	*Landing Systems*	*Not determined*
4.3	*Air Traffic Control*	*Not determined*
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1	*ADAS*	*All present systems*
5.2	*Landing Systems*	*All present systems*
5.3	*Air Traffic Control*	*All present systems*
5.4		

The questionnaire responder should answer Ouestions 6 to 12, on
separate sheets, for each of the new svstems identified in the
answer to Question 1.

New System _Army Digital Avionic Systems_

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	-
6.1.2 Instruments	A
6.1.3 Displays	A
6.1.4 Power Controls	-
6.1.5 Seating Arrangement	D
6.1.6 Visibility	B
6.1.7 Weapon Guidance	-
6.1.8 Guns	-
6.1.9 Rockets	-
6.1.10 Laser	-
6.1.11 Threat Detection	-
6.1.12 Navigation	B
6.1.13 Communication	D
6.1.14 ECM/EW	-
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

_6.1.2 - 6.1.3 New technology and advance the state of the art,
will be much easier to use_

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

6.1.6   Smaller panels
6.1.12 Advanced Map Display

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System _Army Digital Avionic Systems_

Question 7.1   How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	D
7.1.2	Flight Stability	D
7.1.3	Control Responsiveness . .	D
7.1.4	Flying Workload	B
7.1.5	Flight Safety Characteristics	B
7.1.6	Complexity	B
7.1.7	Speed	-
7.1.8	Target Detection Capabilities	-
7.1.9	Weapon Range	-
7.1.10	Weapon Accuracy	-
7.1.11	Troop Capacity	-
7.1.12	Cargo Capacity	C
7.1.13	Other (Speci.	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different", what is the nature of the difference?

Question 7.3   For the performances rated "substantially different", what is the nature of the difference?

     _7.1.4_ _Cut down avionic workload_
     _7.1.5_ _More time and better information provided_
     _7.1.6_ _Need some programming effort_

Question 7.4   For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

     _7.1.12_ _More space and lighter weight in helicopters_

New System _Army Digital Avionic Systems_

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	D
8.1.2	Instrument Flying	B
8.1.3	Nap of Earth Flying	A
8.1.4	Navigation	A
8.1.5	Communication	D
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

8.1.3 Easier to fly
8.1.4 Advanced map display

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

8.1.2 Easier to read instruments and not so many of them

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System *Army Digital Avionic Systems*

Question 9.1 In terms of <u>combat operations tasks</u>, how much difference is there between the new system and current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	-
9.1.2	Target Attack	-
9.1.3	Weapon Aiming and Firing . . .	-
9.1.4	Air-to-Air Combat Flight Maneuvers	-
9.1.5	Air-to-Ground Combat Flight Maneuvers	-
9.1.6	Multiple Aircraft Operation .	-
9.1.7	Reconnaissance	-
9.1.8	Command and Control Information Processing	-
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2 For the operations rated "radically different", what is the nature of the difference?

Question 9.3 For the operations rated "substantially different", what is the nature of the difference?

Question 9.4 For the operations rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System _Army Digital Avionic Systems_

Question 10.1   What are the differences in man-machine skill
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	B
10.1.2	Tracking Outside Aircraft . .	-
10.1.3	Recognition	B
10.1.4	Memory	B
10.1.5	Decision-Making	B
10.1.6	Physical Responses	B
10.1.7	Other (Specify)	-
10.1.8	Other (Specify)	-

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

10.1.1 Displays are easier to read
10.1.3 - 10.1.6 More time for these tasks

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

New System *Army Digital Avionic Systems*

Question 11.1   What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	c
11.1.2	Non-Verbal Exchange	c
11.1.3	Coordinated Physical Responses	c
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2   For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4   For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

*11.1.1 - 11.1.3   Depends on who has displays and the number
of redundant displays*

New System _Army Digital Avionic Systems_

Question 12.1   In terms of training methods, how much difference will there be between the new system and the current systems it replaces? (Note that this differs from Questions 8.1 and 9.1, by emphasizing training difference instead of system operation differences, i.e., differences in system operation might not always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	D
12.1.2	Instrument Flying	D
12.1.3	Nap of Earth Flying	A
12.1.4	Navigation	A
12.1.5	Communications	C
12.1.6	Target Detection	
12.1.7	Target Attack	
12.1.8	Weapon Aiming and Firing . .	
12.1.9	Air-to-Air Combat Flight Maneuvers	
12.1.10	Air-to-Ground Combat Flight Maneuvers	
12.1.11	Multiple Aircraft Operations	
12.1.12	Reconnaissance	
12.1.13	Command and Control Information Processing	
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different", what is the nature of the difference?

12.1.3 - 12.1.4 Better equipment and displays and easier to operate

Question 12.3   For the training areas rated "substantially different", what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different", what is the nature of the difference?

12.1.5 Better control arrangements (functions contained in one box instead of four or five boxes, i.e., IACS)

New System <u>Landing Systems</u>

Question 6.1   How much difference will there be between the new
                system and the current systems which it replaces
                in terms of <u>physical characteristics?</u> (Degrees of
                difference are defined as: "a" = radically different;
                "b" = substantially different; "c" = somewhat
                different; and "d" = minimal or no difference.)

	Component	Degree of Difference
6.1.1	Flight Controls	
6.1.2	Instruments	C
6.1.3	Displays	C
6.1.4	Power Controls	D
6.1.5	Seating Arrangement	D
6.1.6	Visibility	D
6.1.7	Weapon Guidance	
6.1.8	Guns	
6.1.9	Rockets	
6.1.10	Laser	
6.1.11	Threat Detection	
6.1.12	Navigation	
6.1.13	Communication	
6.1.14	ECM/EW	
6.1.15	Other (Specify)	
6.1.16	Other (Specify)	

Question 6.2   For the components rated "radically different", what
                is the nature of the difference?

Question 6.3   For the components rated "substantially different",
                what is the nature of the difference?

Question 6.4   For the components rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.

                6.1.2 - 6.1.3 New equipment and better control features

New System __Landing Systems__

Question 7.1 How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	
7.1.2	Flight Stability	
7.1.3	Control Responsiveness . .	C
7.1.4	Flying Workload	C
7.1.5	Flight Safety Character-istics	C
7.1.6	Complexity	C
7.1.7	Speed	
7.1.8	Target Detection Capabilities	
7.1.9	Weapon Range	
7.1.10	Weapon Accuracy	
7.1.11	Troop Capacity	
7.1.12	Cargo Capacity	
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2 For the performances rated "radically different",
what is the nature of the difference?

Question 7.3 For the performances rated "substantially different",
what is the nature of the difference?

Question 7.4 For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

 7.1.3 - 7.1.6 Less complex (new equipment representing
advanced state of art)

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New System _Landing Systems_

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

<u>Operation</u>   <u>Degree of Difference</u>

8.1.1   Basic Flying . . . .   _____

8.1.2   Instrument Flying . . . .   ___*c*___

8.1.3   Nap of Earth Flying . . . . .   _____

8.1.4   Navigation . . . .   _____

8.1.5   Communication . . . .   _____

8.1.6   Other (Specify) . . . .   _____

8.1.7   Other (Specify) . . . .   _____

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

8.1.2 New system

New System _Landing Systems_

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and ·.
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	N/A
9.1.2	Target Attack	N/A
9.1.3	Weapon Aiming and Firing . . .	N/A
9.1.4	Air-to-Air Combat Flight Maneuvers	N/A
9.1.5	Air-to-Ground Combat Flight Maneuvers	N/A
9.1.6	Multiple Aircraft Operation .	N/A
9.1.7	Reconnaissance	N/A
9.1.8	Command and Control Information Processing	N/A
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System ___Landing Systems___

Question 10.1 What are the differences in man-machine skill
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	c
10.1.2	Tracking Outside Aircraft . .	
10.1.3	Recognition	
10.1.4	Memory	
10.1.5	Decision-Making	c
10.1.6	Physical Responses	c
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2 For the skills rated "radically different", what is
the nature of the difference?

Question 10.3 For the skills rated "substantially different",
what is the nature of the difference?

Question 10.4 For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

10.1.1 Integrated system
10.1.5 Easier
10.1.6 Integrated system

New System___ *Landing Systems*_____

Question 11.1　What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	D
11.1.2	Non-Verbal Exchange	D
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2　For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3　For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4　For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System   *Landing Systems*

Question 12.1   In terms of training methods, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing training
difference instead of system operation differences,
i.e., differences in system operation might not
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	D
12.1.2	Instrument Flying	C
12.1.3	Nap of Earth Flying	
12.1.4	Navigation	
12.1.5	Communications	
12.1.6	Target Detection	
12.1.7	Target Attack	
12.1.8	Weapon Aiming and Firing . .	
12.1.9	Air-to-Air Combat Flight Maneuvers	
12.1.10	Air-to-Ground Combat Flight Maneuvers	
12.1.11	Multiple Aircraft Operations	
12.1.12	Reconnaissance	
12.1.13	Command and Control Information Processing	
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

   *12.1.2 Training methods should reflect characteristics of
            new system*

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Question 13   As stated at the beginning of the questionnaire
                the objective of this study is to identify new Army
                aviation systems and system characteristics which
                will require behavioral changes necessitating new
                training techniques.

                Given this objective, is there anything further
                which you believe will require changes in training
                as a result of the introduction of new Army aviation
                systems?

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE _6 May 1980_   QUESTIONNAIRE NO. _____7_____

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
              inventory for the period of 1985 to 2000 (within your
              area of cognizance)?

              1.1   _AH-64 Attack Helicopter_____
              1.2   _____
              1.3   _____
              1.4   _____

Question 2   What are the probabilities that each of these new
              systems will be introduced into Army inventory?
              (Values of probability are defined as 1.0 = almost
              certain, 0.8 = highly probable, 0.6 = probable,
              0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	_AH-64_	_0.8_
2.2		
2.3		
2.4		

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
3.1	AH-64	1984
3.2		
3.3		
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	AH-64	C
4.2		
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1	AH-64	Cobra S
5.2		
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on
separate sheets, for each of the new systems identified in the
answer to Question 1.

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New System _____AH-64_____

Question 6.1   How much difference will there be between the new
               system and the current systems which it replaces
               in terms of <u>physical characteristics</u>? (Degrees of
               difference are defined as: "a" = radically different;
               "b" = substantially different; "c" = somewhat
               different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	D
6.1.2 Instruments	C
6.1.3 Displays	C
6.1.4 Power Controls	D
6.1.5 Seating Arrangement	D
6.1.6 Visibility	D
6.1.7 Weapon Guidance	B
6.1.8 Guns	D
6.1.9 Rockets	D
6.1.10 Laser	C
6.1.11 Threat Detection	C
6.1.12 Navigation	D
6.1.13 Communication	D
6.1.14 ECM/EW	D
6.1.15 Other (Specify) *Pilot Night Vision*	A
6.1.16 Other (Specify) *Target Acquisition*	A
6.1.17 Other (Specify) *Optics, FLIR, LLTV*	A

Question 6.2   For the components rated "radically different", what
               is the nature of the difference?

               6.1.15 (Pilot Night Vision) - AH-1 Cobra Night Vision, goggles only
               *   AH-64 FLIR, Optics, LLTV, Helmet Display*

Question 6.3   For the components rated "substantially different",
               what is the nature of the difference?

Question 6.4   For the components rated "somewhat different", is
               the difference enough to require a change in training
               methods? If so, indicate the nature of the difference.

               AH-64 Bar displays, expanded HUD
               AH-1 Gauges, gunsight HUD

New System   _AH-64_____

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	B
7.1.2	Flight Stability	C
7.1.3	Control Responsiveness . .	B
7.1.4	Flying Workload	C
7.1.5	Flight Safety Character-istics	C
7.1.6	Complexity	B
7.1.7	Speed	C
7.1.8	Target Detection Capa-bilities	A
7.1.9	Weapon Range	B
7.1.10	Weapon Accuracy	D
7.1.11	Troop Capacity	B
7.1.12	Cargo Capacity	C
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

Covered in 6

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

Agility, maneuverability, superior to AH-1
More power, control response better
Maintenance - box concept, complex
25 to 30 percent greater in weapon range

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System _AH-64_

Question 8.1 In terms of <u>cockpit crew operations</u>, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

<u>Operation</u>   <u>Degree of Difference</u>

8.1.1 Basic Flying . . . .   _D_

8.1.2 Instrument Flying . . . .   _D_

8.1.3 Nap of Earth Flying . . . . .   _B_

8.1.4 Navigation . . . .   _D_

8.1.5 Communication . . . .   _D_

8.1.6 Other (Specify) . . . .   _____

8.1.7 Other (Specify) . . . .   _____

Question 8.2 For the operations rated "radically different", what
is the nature of the difference?

Question 8.3 For the operations rated "substantially different",
what is the nature of the difference?

Nap of earth flying - more training needed
(PNVS) night flying and WX training

Question 8.4 For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

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New System____AH-64_____

Question 8.1 In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	D
8.1.2	Instrument Flying	D
8.1.3	Nap of Earth Flying	B
8.1.4	Navigation	D
8.1.5	Communication	D
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2 For the operations rated "radically different", what
is the nature of the difference?

Question 8.3 For the operations rated "substantially different",
what is the nature of the difference?
Nap of earth flying - more training needed
(PNVS) night flying & WX training

Question 8.4 For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System _AH-64_

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	B
9.1.2	Target Attack	D
9.1.3	Weapon Aiming and Firing . . .	C
9.1.4	Air-to-Air Combat Flight Maneuvers	N/A
9.1.5	Air-to-Ground Combat Flight Maneuvers	D
9.1.6	Multiple Aircraft Operation .	D
9.1.7	Reconnaissance	N/A
9.1.8	Command and Control Information Processing	D
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

Covered in Question 6
Shifts in memory skills such as automated preflight procedures
and engine starting
Combat and flight operations are same for AH-64 and AH-1,
but job is getting more difficult

New System   *AH-64*

Question 10.1   What are the differences in <u>man-machine skill</u>
<u>requirements</u> between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

Skill Category	Degree of Difference
10.1.1 Monitoring Displays	B
10.1.2 Tracking Outside Aircraft . .	D
10.1.3 Recognition	B
10.1.4 Memory	B
10.1.5 Decision-Making	C
10.1.6 Physical Responses	C
10.1.7 Other (Specify)	
10.1.8 Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
the nature of the difference?

Question 10.3   For the skills rated "substantially different",
what is the nature of the difference?

> *10.1.1 More research to build necessary confidence*
> *PNVS (coordination of flying and helmet display)*
> *10.1.3 TADS and FLIR image will be different*
> *teach a guy how to recognize targets on FLIR image*
> *10.1.4 Shift in memory skills - mission up, non-mission down*

Question 10.4   For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

> *10.1.5 Target identification easier - more time for real decision*
> *making*
> *10.1.6 Criteria for PNVS in AH-64, AH-64 easier to fly NOE at*
> *night primary consideration*
>
> *People selection (Research Item Dominant Eye Problem*
> *to be resolved)*

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New System *AH-64*

Question 11.1   What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	*D*
11.1.2	Non-Verbal Exchange	*D*
11.1.3	Coordinated Physical Responses	*D*
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2   For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4   For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System   AH-64

Question 12.1   In terms of training methods, how much difference
                  will there be between the new system and the current
                  systems it replaces? (Note that this differs from
                  Questions 8.1 and 9.1, by emphasizing training
                  difference instead of system operation differences,
                  i.e., differences in system operation might not
                  always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	D
12.1.2	Instrument Flying	D
12.1.3	Nap of Earth Flying	D
12.1.4	Navigation	D
12.1.5	Communications	D
12.1.6	Target Detection	B
12.1.7	Target Attack	D
12.1.8	Weapon Aiming and Firing . .	D
12.1.9	Air-to-Air Combat Flight Maneuvers	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	D
12.1.11	Multiple Aircraft Operations	D
12.1.12	Reconnaissance	N/A
12.1.13	Command and Control Information Processing	D
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
                  what is the nature of the difference?

                  12.1.9 Air-to-air in all systems

Question 12.3   For the training areas rated "substantially different",
                  what is the nature of the difference?

                  12.1.6 TADS

Question 12.4   For the training areas rated "somewhat different",
                  what is the nature of the difference?

Question 13   As stated at the beginning of the questionnaire
the objective of this study is to identify new Army
aviation systems and system characteristics which
will require behavioral changes necessitating new
training techniques.

Given this objective, is there anything further
which you believe will require changes in training
as a result of the introduction of new Army aviation
systems?

*Significant thing about AH-64 is night capability (PNVS)
(FLIR and LLTV) (also optic system).*

*Another area - how do we train pilots - backseat only -
or do we train a guy for both seats? Would like to see
a guy qualified for both seats.*

Separate night pilots and day pilots.

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE___27 May 1980___   QUESTIONNAIRE NO.___8___

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation systems and system characteristics which will require behavioral changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation inventory for the period of 1985 to 2000 (within your area of cognizance)?

    1.1   _____LH-X_____

    1.2   _____SEMA-X_____

    1.3   _____

    1.4   _____

Question 2   What are the probabilities that each of these new systems will be introduced into Army inventory? (Values of probability are defined as 1.0 = almost certain, 0.8 = highly probable, 0.6 = probable, 0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	LH-X	0.6
2.2	SEMA-X	0.8
2.3		
2.4		

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
3.1	LH-X	1992-1995 (planned)
3.2	SEMA-X	1990-1995 (planned)
3.3		
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	LH-X	A
4.2	SEMA-X	D
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1	LH-X	AH-1, OH-58
5.2	SEMA-X	OV-1, RU-21, EH-1
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on
separate sheets, for each of the new systems identified in the
answer to Question 1.

New System _____ *LH-X* _____

Question 6.1   How much difference will there be between the new
                system and the current systems which it replaces
                in terms of <u>physical characteristics</u>? (Degrees of
                difference are defined as: "a" = radically different;
                "b" = substantially different; "c" = somewhat
                different; and "d" = minimal or no difference.)

<u>Component</u>	<u>Degree of Difference</u>
6.1.1 Flight Controls	*A*
6.1.2 Instruments	*A*
6.1.3 Displays	*A*
6.1.4 Power Controls	*A*
6.1.5 Seating Arrangement	*A*
6.1.6 Visibility	*A*
6.1.7 Weapon Guidance	*B*
6.1.8 Guns	*D*
6.1.9 Rockets	*D*
6.1.10 Laser	*D*
6.1.11 Threat Detection	*A*
6.1.12 Navigation	*A*
6.1.13 Communication	*A*
6.1.14 ECM/EW	*C*
6.1.15 Other (Specify) *Self-delployability*	*B*
6.1.16 Other (Specify) *New protective environment*	*A*

Question 6.2   For the components rated "radically different", what
                is the nature of the difference?

                6.1.2 - 6.1.3 Integrated into HUD and CRT display
                6.1.5 One-man seat
                            (continued on attached)

Question 6.3   For the components rated "substantially different",
                what is the nature of the difference?

                6.1.7 Fire and forget
                6.1.15 Refuelability across the Atlantic Ocean

Question 6.4   For the components rated "somewhat different", is
                the difference enough to require a change in training
                methods? If so, indicate the nature of the difference.

                6.1.14 Evasive maneuvers

New System_____LH-X_____

Question 6.2 (Continued)

> *6.1.11 Integrated threat detection*
>
> *6.1.12 No maps; NOE at 200 knots*
>
> *6.1.13 Voice encoded coordinate locations on CRT*

New System_____LH-X_____

New System_____*LH-X*_____

Question 7.1   How much performance difference will there be
               between the new system and the current systems
               which it replaces? (Degrees of difference are
               defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	A
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	A
7.1.4	Flying Workload	A
7.1.5	Flight Safety Characteristics	C
7.1.6	Complexity	C
7.1.7	Speed	A
7.1.8	Target Detection Capabilities	B
7.1.9	Weapon Range	B
7.1.10	Weapon Accuracy	B
7.1.11	Troop Capacity	N/A
7.1.12	Cargo Capacity	N/A
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
               what is the nature of the difference?

               7.1.1 Replace some of black box
               7.1.4 Drastic reduction

Question 7.3   For the performances rated "substantially different",
               what is the nature of the difference?

               7.1.8 Increase capabilities
               7.1.9 - 7.1.10 Radically different sensor

Question 7.4   For the performances rated "somewhat different", is
               the difference enough to require a change in training
               methods? If so, indicate the nature of the difference.

               7.1.5 Automatic limiting of flight conditions not planned,
               *   increased maneuverability could increase risk*
               7.1.6 All displays integrated, less complexity for pilot

New System_____LH-X_____

Question 8.1   In terms of cockpit crew operations, how much
                difference is there between the new system and
                the current systems which it replaces? (Degrees
                of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	C
8.1.2	Instrument Flying	B
8.1.3	Nap of Earth Flying	A
8.1.4	Navigation *(NQE)*.	B
8.1.5	Communication	C
8.1.6	Other (Specify) *Path Finding* . . .	C
8.1.7	Other (Specify) *NBC Operations* . .	A
8.1.8	*Operation in icing condition*	C
8.1.9	*Wire-cutting operations*	B

Question 8.2   For the operations rated "radically different", what
                is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
                what is the nature of the difference?

  8.1.4 Satellite navigation in NOE

Question 8.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

  8.1.1 Increase maneuverability
  8.1.5 Reduce workload
  *8.1.6 Knowing where you are and where you are going
          under NOE conditions*
  8.1.8 LH-X will have de-icing

New System ___LH-X___

Question 9.1 In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	B
9.1.2	Target Attack	A
9.1.3	Weapon Aiming and Firing . . .	A
9.1.4	Air-to-Air Combat Flight Maneuvers	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	B
9.1.6	Multiple Aircraft Operation .	C
9.1.7	Reconnaissance	C
9.1.8	Command and Control Information Processing	B
* 9.1.9	Other (Specify)	A
9.1.10	Other (Specify)	

Question 9.2 For the operations rated "radically different", what
is the nature of the difference?

9.1.2 Launch and leave
9.1.4 New weapon suit for mm wave radar for threat detection

Question 9.3 For the operations rated "substantially different",
what is the nature of the difference?

9.1.1 Much more automation in cueing of pilot
9.1.5 Less hover time

Question 9.4 For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

9.1.6 Dedicated ECM with group
9.1.7 Armed reconnaissance

*Penetrating FEBA, attacking enemy reserve units

New System_____ _LH-X_ _____

Question 10.1   What are the differences in man-machine skill
                 requirements between the new system and the current
                 systems which it replaces? (Degrees of difference
                 are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	B
10.1.2	Tracking Outside Aircraft . .	B
10.1.3	Recognition	B
10.1.4	Memory	B
10.1.5	Decision-Making	B
10.1.6	Physical Responses	C
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
                 the nature of the difference?

Question 10.3   For the skills rated "substantially different",
                 what is the nature of the difference?

10.1.1 Much less information processing by pilot
10.1.3 One-man cockpit
10.1.4 Much more storage and use automation
10.1.5 Pilot decisions versus decisions machine can make
10.1.6 Less stable (utilization of maneuverability)

Question 10.4   For the skills rated "somewhat different", is the
                 difference enough to require a change in training
                 methods? If so, indicate the nature of the
                 difference.

New System _____ _LH-X_ _____

Question 11.1   What are the differences in crew interaction
                requirements between the new system and the current
                systems which it replaces? (Degrees of difference
                are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	_N/A_
11.1.2	Non-Verbal Exchange	_N/A_
11.1.3	Coordinated Physical Responses	_N/A_
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2   For the interactions rated "radically different",
                what is the nature of the difference?

Question 11.3   For the interactions rated "substantially different",
                what is the nature of the difference?

Question 11.4   For the interactions rated "somewhat different",
                is the difference enough to require a change in
                training methods?

New System _____LH-X_____

Question 12.1 In terms of training methods, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing training
difference instead of system operation differences,
i.e., differences in system operation might not
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	B
12.1.2	Instrument Flying	B
12.1.3	Nap of Earth Flying	B
12.1.4	Navigation	B
12.1.5	Communications	C
12.1.6	Target Detection	B
12.1.7	Target Attack	A
12.1.8	Weapon Aiming and Firing . .	A
12.1.9	Air-to-Air Combat Flight Maneuvers	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	B
12.1.11	Multiple Aircraft Operations	C
12.1.12	Reconnaissance	C
12.1.13	Command and Control Information Processing	B
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2 For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3 For the training areas rated "substantially different",
what is the nature of the difference?

12.1.1 Side arm controller
12.1.2 - 12.1.3 More maneuverability under adverse weather
12.1.4 Path finding
12.1.10 More performance type training

Question 12.4 For the training areas rated "somewhat different",
what is the nature of the difference?

New System ___SEMA-X___

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics?</u>   (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

	Component	Degree of Difference
6.1.1	Flight Controls	A
6.1.2	Instruments	A
6.1.3	Displays	A
6.1.4	Power Controls	B
6.1.5	Seating Arrangement	D
6.1.6	Visibility	D
6.1.7	Weapon Guidance	N/A
6.1.8	Guns	N/A
6.1.9	Rockets	N/A
6.1.10	Laser . . . *Designation* . . .	C
6.1.11	Threat Detection	B
6.1.12	Navigation	B
6.1.13	Communication	C
6.1.14	ECM/EW	B
6.1.15	Other (Specify) . . . *Intelligence - real time aspect*	B
6.1.16	Other (Specify) *Transmission to. Field Commander*	B

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?
6.1.12 Inertial or pulse Doppler
6.1.14 Down on deck/close range
*6.1.15 Artificial intelligence - electronic algorithms to
enhance images - multi-spectral image building*

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods?   If so, indicate the nature of the difference.

6.1.13 Secure data link

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New System_____*SEMA-X*_____

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	D
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	D
7.1.4	Flying Workload	B
7.1.5	Flight Safety Character- istics	C
7.1.6	Complexity	B
7.1.7	Speed	D
7.1.8	Target Detection Capa- bilities	A
7.1.9	Weapon Range	N/A
7.1.10	Weapon Accuracy	N/A
7.1.11	Troop Capacity	N/A
7.1.12	Cargo Capacity	N/A
7.1.13	Other (Specify)*Electronic equipment volume*	C
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

> *7.1.8   Millimeter wave radar may be used extensively for*
> *all-weather reconnaissance*
> *Also see Question 6*

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

> *7.1.2   Stability needed for pointing a raster side-looking radar*
> *7.1.4   Workload will increase*
> *7.1.6   Different types of intelligence gathering sensors and*
> *processors*

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

> *7.1.5   Generally safer*

New System _____SEMA-X_____

Question 8.1   In terms of <u>cockpit crew operations</u>, how much
                difference is there between the new system and
                the current systems which it replaces? (Degrees
                of difference are defined in Question 6.1).

                        <u>Operation</u>   <u>Degree of Difference</u>

                8.1.1 Basic Flying . . . .   _____B_____

                8.1.2 Instrument Flying . . . .   _____D_____

                8.1.3 Nap of Earth Flying . . . . .   _____D_____

                8.1.4 Navigation . . . .   _____B_____

                8.1.5 Communication . . . .   _____B_____

                8.1.6 Other (Specify) *Microwave Landing System* C

                8.1.7 Other (Specify) . . . .   _____

Question 8.2   For the operations rated "radically different", what
                is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
                what is the nature of the difference?

                *8.1.1 For transition mode XV-15, X wing, directed thrust (AV-8).
                        If current type aircraft is chosen, then no change.*
                8.1.4 Substantially more precise location, tracking, and stability
                *8.1.5 Much more on-board processing for real-time intelligence to
                        Field Commander*

Question 8.4   For the operations rated "somewhat different", is
                the difference enough to require a change in
                training methods? If so, indicate the nature of
                the difference.

                8.1.6 Air Traffic Management Systems

New System_____*SEMA-X*_____

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	N/A
9.1.3	Weapon Aiming and Firing . . .	N/A
9.1.4	Air-to-Air Combat Flight Maneuvers	N/A
9.1.5	Air-to-Ground Combat Flight Maneuvers	N/A
9.1.6	Multiple Aircraft Operation .	C
9.1.7	Reconnaissance	˙B
9.1.8	Command and Control Information Processing	B
9.1.9	Other (Specify) *Target Designation*	C
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

   9.1.1 See Questions 6 and 7

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

   9.1.7 See Question 7
   9.1.8 See Question 8

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

   *9.1.6 Occasionally send two now for triangulation - type
   target fixing, primary for electronic emitters.
   SEMA-X will use time as variable.*
   9.1.7 Laser designation

New System ___SEMA-X___

Question 10.1   What are the differences in <u>man-machine skill requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	<u>Skill Category</u>	<u>Degree of Difference</u>
10.1.1	Monitoring Displays	C
10.1.2	Tracking Outside Aircraft . .	D
10.1.3	Recognition	D
10.1.4	Memory	C
10.1.5	Decision-Making	B
10.1.6	Physical Responses	D
10.1.7	Other (Specify) *Intelligence Gathering*	B
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

10.1.5 Radar warning now tells quadrant in which threat is located. In future, maneuver and timing will be dictated to pilot by computer processing of threat information.

10.1.7 More highly automated

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

10.1.1 More types of displays will have to be oriented

10.1.4 Machinery will offset additional loading

New System ___SEMA-X___

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	D
11.1.2	Non-Verbal Exchange	D
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify) .*Time Aloft* . .	C
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

> *11.1.4 Time aloft will be increased to minimize aircraft
> numbers required. Airplane can be flown by one man,
> but time aloft will require both to be pilots, since
> it will be very fatiguing.*

New System _____SEMA-X_____

Question 12.1   In terms of training methods, how much difference
                will there be between the new system and the current
                systems it replaces? (Note that this differs from
                Questions 8.1 and 9.1, by emphasizing training
                difference instead of system operation differences,
                i.e., differences in system operation might not
                always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	D
12.1.2	Instrument Flying	C
12.1.3	Nap of Earth Flying	D
12.1.4	Navigation	D
12.1.5	Communications	D
12.1.6	Target Detection	D
12.1.7	Target Attack	N/A
12.1.8	Weapon Aiming and Firing . .	N/A
12.1.9	Air-to-Air Combat Flight Maneuvers	N/A
12.1.10	Air-to-Ground Combat Flight Maneuvers	N/A
12.1.11	Multiple Aircraft Operations	N/A
12.1.12	Reconnaissance	C
12.1.13	Command and Control Information Processing	C
12.1.14	Other (Specify) Intelligence .	C
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
                what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
                what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
                what is the nature of the difference?

                12.1.2   Display watching, microwave landing system

                12.1.12 - 12.1.14 Greater use of synthetic displays

Question 13   As stated at the beginning of the questionnaire
               the objective of this study is to identify new Army
               aviation systems and system characteristics which
               will require behavioral changes necessitating new
               training techniques.

               Given this objective, is there anything further
               which you believe will require changes in training
               as a result of the introduction of new Army aviation
               systems?

               Army aviation will be a combat-oriented activity

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE _28 May 1980_   QUESTIONNAIRE NO._____9_____

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
              inventory for the period of 1985 to 2000 (within your
              area of cognizance)?

              1.1 _____AAH_____
              1.2 _____
              1.3 _____
              1.4 _____

Question 2   What are the probabilities that each of these new
              systems will be introduced into Army inventory?
              (Values of probability are defined as 1.0 = almost
              certain, 0.8 = highly probable, 0.6 = probable,
              0.4 = uncertain, and 0.2 = highly unlikely.)

                       New System   Probability

              2.1 _____AAH_____   _____0.8_____
              2.2 _____   _____
              2.3 _____   _____
              2.4 _____   _____

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
3.1	AAH	1984
3.2		
3.3		
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	AAH	c
4.2		
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1	AAH	Cobra
5.2		
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on
separate sheets, for each of the new systems identified in the
answer to Question 1.

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New System _____ AAH _____

Question 6.1   How much difference will there be between the new
               system and the current systems which it replaces
               in terms of physical characteristics? (Degrees of
               difference are defined as: "a" = radically different;
               "b" = substantially different; "c" = somewhat
               different; and "d" = minimal or no difference.)

	Component	Degree of Difference
6.1.1	Flight Controls	D for pilot A for CP/G
6.1.2	Instruments	C for pilot
6.1.3	Displays	A
6.1.4	Power Controls	C
6.1.5	Seating Arrangement	D
6.1.6	Visibility	D
6.1.7	Weapon Guidance	B
6.1.8	Guns	D
6.1.9	Rockets	C
6.1.10	Laser	N/A
6.1.11	Threat Detection	B
6.1.12	Navigation	D
6.1.13	Communication	D
6.1.14	ECM/EW	D
6.1.15	Other (Specify) TADS for Co-pilot/ Gunner	A
6.1.16	Other (Specify)	

Question 6.2   For the components rated "radically different", what
               is the nature of the difference?

               6.1.3 TADS display for co-pilot/gunner, PNVS display for pilot

Question 6.3   For the components rated "substantially different",
               what is the nature of the difference?

               6.1.7 TADS for co-pilot/gunner

Question 6.4   For the components rated "somewhat different", is
               the difference enough to require a change in training
               methods? If so, indicate the nature of the difference.

               6.1.4 Twin engine versus single engine
               6.1.9 Pilot has capabilities for 30 mm gun and 2.75 inch rockets

New System _____ *AAH* _____

Question 7.1   How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	*B*
7.1.2	Flight Stability	*D*
7.1.3	Control Responsiveness . .	*B*
7.1.4	Flying Workload . *Pilot* . . .	*B*
7.1.5	Flight Safety Character-istics	*A*
7.1.6	Complexity *for Pilot/Co-pilot/Gunner* . .	*B*
7.1.7	Speed	*C*
7.1.8	Target Detection Capa-bilities	*A*
7.1.9	Weapon Range *Longer*	*B*
7.1.10	Weapon Accuracy	*C*
7.1.11	Troop Capacity	*N/A*
7.1.12	Cargo Capacity	*N/A*
7.1.13	Other (Specify) *Survivability*	*A*
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different",
what is the nature of the difference?

> *7.1.5   42 ft/sec crash load survival twin-engine*
> *7.1.8   TADS*
> *7.1.13 Single 23 mm hit survivable aircraft*

Question 7.3   For the performances rated "substantially different",
what is the nature of the difference?

> *7.1.1 More power available than any previous helicopter*
> *7.1.3 Superior accelerations*
> *7.1.4 Higher workload under both visual and PNVS*
> *7.1.6 Cross-training*

Question 7.4   For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System_____AAH_____

Question 8.1　In terms of <u>cockpit crew operations</u>, how much difference is there between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Operation	Degree of Difference	
	Pilot	CP/G
8.1.1　Basic Flying	D	D
8.1.2　Instrument Flying	C	D
8.1.3　Nap of Earth Flying	A	A
8.1.4　Navigation	D	D
8.1.5　Communication	D	D
8.1.6　Other (Specify) . . *FDLS* . . .	N/A	A
8.1.7　Other (Specify) . . *Stabilator* .	C	C

Question 8.2　For the operations rated "radically different", what is the nature of the difference?

8.1.6　FDLS Fault Detection Isolation System
　　　System status on PNVS CRT
　　　System status on TADS CRT
　　　Caution or warning light cue to check system status

Question 8.3　For the operations rated "substantially different", what is the nature of the difference?

8.1.7　Aural tone warning for stabilator

Question 3.4　For the operations rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System _____AAH_____

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference	
		Pilot	CP/G
9.1.1	Target Detection	D	A
9.1.2	Target Attack	C-D	C-D
9.1.3	Weapon Aiming and Firing . . .	C	C
9.1.4	Air-to-Air Combat Flight Maneuvers	A	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	C	C
9.1.6	Multiple Aircraft Operation .	D	D
9.1.7	Reconnaissance	N/A	N/A
9.1.8	Command and Control Information Processing	C	C
9.1.9	Other (Specify)		
9.1.10	Other (Specify)		

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

9.1.1 TADS
9.1.4 No current doctrine

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

*9.1.5 Control power and power margins will make all maneuvers
        better and faster*
*9.1.8 Pre-pointing of system to coordinates furnished from
        outside source*

New System _____ _AAH_____

Question 10.1   What are the differences in <u>man-machine skill</u> <u>requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Skill Category	Degree of Difference	
		Pilot	CP/G
10.1.1	Monitoring Displays	A	A
10.1.2	Tracking Outside Aircraft . .	A	A
10.1.3	Recognition	N/A	D
10.1.4	Memory	B	B
10.1.5	Decision-Making	B	B
10.1.6	Physical Responses	C	C
10.1.7	Other (Specify) . . _Detection_ .	N/A	A
10.1.8	Other (Specify) . . _Acquisition_	N/A	A

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

10.1.2 Night tracking with TADS/PNVS is a totally new capability
10.1.7 - 10.1.8 TADS/optics quality and stability

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

10.1.4 Will have to memorize (i.e., train) for many different modes of operation and attacks. Capable of operating in degraded modes. Must recall the best way of doing job.
10.1.5 Many more decisions to make, weapons to use, etc. Some processing of data will be relieved by computer.

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

10.1.6 Higher visual activities. Reaction times must be quicker. More alert and finer tuning.

New System _____AAH_____

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	C
11.1.2	Non-Verbal Exchange	B
11.1.3	Coordinated Physical Responses	D
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

*11.1.2 Possibly require training as a team. Very good rapport
in all team activity.*

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

*11.1.1 Only through intercom system. Barrier between seats
precludes physical contact.*

New System_____AAH_____

Question 12.1   In terms of <u>training methods</u>, how much difference
                will there be between the new system and the current
                systems it replaces? (Note that this differs from
                Questions 8.1 and 9.1, by emphasizing <u>training</u>
                difference instead of <u>system operation</u> differences,
                i.e., differences in system operation might <u>not</u>
                always necessitate differences in training methods.)

	Training Areas	Pilot	CP/G
12.1.1	Basic Flying *more sophisticated*	C	C
12.1.2	Instrument Flying	D	D
12.1.3	Nap of Earth Flying	B	B
12.1 4	Navigation	D	D
12.1.5	Communications	N/A	C
12.1.6	Target Detection	C	C
12.1.7	Target Attack *pilot fires rockets*	C	C
12.1.8	Weapon Aiming and Firing	C	C
12.1.9	Air-to-Air Combat Flight Maneuvers	A	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	C	C
12.1.11	Multiple Aircraft Operations	D	D
12.1.12	Reconnaissance	N/A	N/A
12.1.13	Command and Control Information Processing	C	C
12.1.14	Other (Specify) *Engine Failure*	B	
12.1.15	Other (Specify) *Target Acquisition*	N/A	C
12.1.16	Other *Target Recognition*	N/A	C

Degree of Difference heading spans Pilot / CP/G columns.

Question 12.2   For the training areas rated "radically different",
                what is the nature of the difference?

                12.1.9 No doctrine now

Question 12.3   For the training areas rated "substantially different",
                what is the nature of the difference?

                *12.1.3 Input positions from ground observer coordinates
                        (Hellfire, lock-on, etc.)*

Question 12.4   For the training areas rated "somewhat different",
                what is the nature of the difference?

                12.1.1 More sophistication
                12.1.10 More capability

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Question 13   As stated at the beginning of the questionnaire
the objective of this study is to identify new Army
aviation systems and system characteristics which
will require behavioral changes necessitating new
training techniques.

Given this objective, is there anything further
which you believe will require changes in training
as a result of the introduction of new Army aviation
systems?

Crew involved in FARP activity. Must be able to direct.

Preflight is different, e.g., systems test - FDLS
(Fault Detection Location System).

APU on system.

Mission planning requirements more severe.

Lock-on <u>after</u> launch firing requires more information,
more planning, more responsibility.

<u>*Possible Additions*</u>

a)   <u>A</u>utomatic <u>D</u>ata <u>L</u>ink for <u>T</u>arget <u>H</u>and-off <u>S</u>ystem (ATHS)

b)   *Projected Map Display*

   on CRT, dedicated CRT on test may or may not be dedicated
   <u>*map in cassette, optical projection*</u>

c)   *Fire-and-Forget Missile*

   Imaging IR system (IIR System)

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE _____27 May 1980_____   QUESTIONNAIRE NO. _____10_____

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation
systems and system characteristics which will require behavioral
changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation
              inventory for the period of 1985 to 2000 (within your
              area of cognizance)?

              1.1   _ADOCS (Advanced Digital Optical Control System)_

              1.2   _IDSV (Integrated Digital Systems Validation)_

              1.3   _____

              1.4   _____

Question 2   What are the probabilities that each of these new
              systems will be introduced into Army inventory?
              (Values of probability are defined as 1.0 = almost
              certain, 0.8 = highly probable, 0.6 = probable,
              0.4 = uncertain, and 0.2 = highly unlikely.)

                        New System   Probability

              2.1   _ADOCS_____   _1.0_____

              2.2   _IDSV_____   _1.0_____

              2.3   _____   _____

              2.4   _____   _____

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Question 3   What are the scheduled years for introducing each of these new aviation systems?

	New System	Year
3.1	ADOCS	1987-1990
3.2	IDSV	1987-1990
3.3		
3.4		

Question 4   How extensive will be the use of each of these new systems? (Degrees of use are defined as "a" = more than three thousand items, "b" = one to three thousand items, "c" = three hundred to one thousand items, "d" = one to three hundred items, and "e" = thirty to one hundred items.)

	New System	Degree of Use
4.1	ADOCS	C
4.2	IDSV	C
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced by each of these systems?

	New Systems	Current Systems
5.1	ADOCS	All mechanical control systems
5.2	IDSV	
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on separate sheets, for <u>each of the new systems</u> identified in the answer to Question 1.

New System   _ADOCS_

Question 6.1 How much difference will there be between the new system and the current systems which it replaces in terms of <u>physical characteristics</u>? (Degrees of difference are defined as: "a" = radically different; "b" = substantially different; "c" = somewhat different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	A
6.1.2 Instruments	B
6.1.3 Displays	B
6.1.4 Power Controls	B
6.1.5 Seating Arrangement	B
6.1.6 Visibility	B
6.1.7 Weapon Guidance	B
6.1.8 Guns	C
6.1.9 Rockets	C
6.1.10 Laser	N/A
6.1.11 Threat Detection	N/A
6.1.12 Navigation	B
6.1.13 Communication	B
6.1.14 ECM/EW	B
6.1.15 Other (Specify) _Survivability_	A
6.1.16 Other (Specify) _Vulnerability_	A

Question 6.2 For the components rated "radically different", what is the nature of the difference?

    6.1.15 1000-fold improvement over dual redundant mechanical system

Question 6.3 For the components rated "substantially different", what is the nature of the difference?

    6.1.3 CRT displays
    6.1.5 One-man cockpit
                      (continued on attached)

Question 6.4 For the components rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System _____ *ADOCS* _____

Question 6.3 (Continued)

> *6.1.6 Side-arm control clears down and front from control*
> *system parts*
> *6.1.7 Air-to-air capabilities*
> *6.1.12 - 6.1.14 Working in an integrated manner with all others*

New System___*ADOCS*___

Question 7.1 How much performance difference will there be
between the new system and the current systems
which it replaces? (Degrees of difference are
defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	B
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	C
7.1.4	Flying Workload	B
7.1.5	Flight Safety Character-istics	B
7.1.6	Complexity	B
7.1.7	Speed	N/A
7.1.8	Target Detection Capa-bilities	N/A
7.1.9	Weapon Range	N/A
7.1.10	Weapon Accuracy	C
7.1.11	Troop Capacity	N/A
7.1.12	Cargo Capacity	B
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2 For the performances rated "radically different",
what is the nature of the difference?

Question 7.3 For the performances rated "substantially different",
what is the nature of the difference?

7.1.1   Operate at night
7.1.4   Less workload
7.1.6   Modularized and self-diagnosed
7.1.12 HLH requires ADOCS

Question 7.4 For the performances rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

7.1.10 Get on target faster

New System _____ *ADOCS* _____

Question 8.1   In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	B
8.1.2	Instrument Flying	B
8.1.3	Nap of Earth Flying	B
8.1.4	Navigation	B
8.1.5	Communication	B
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

8.1.1 Side-arm control and integrated cockpit controls
8.1.2 - 8.1.5 See Question 6

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System _____ *ADOCS* _____

Question 9.1 In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	N/A
9.1.2	Target Attack	N/A
9.1.3	Weapon Aiming and Firing . . .	N/A
9.1.4	Air-to-Air Combat Flight Maneuvers	N/A
9.1.5	Air-to-Ground Combat Flight Maneuvers	D
9.1.6	Multiple Aircraft Operation .	N/A
9.1.7	Reconnaissance	N/A
9.1.8	Command and Control Information Processing	N/A
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2 For the operations rated "radically different", what
is the nature of the difference?

Question 9.3 For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4 For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System_____ *ADOCS*_____

Question 10.1 What are the differences in <u>man-machine skill</u>
<u>requirements</u> between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	*N/A*
10.1.2	Tracking Outside Aircraft . .	*N/A*
10.1.3	Recognition	*N/A*
10.1.4	Memory	*N/A*
10.1.5	Decision-Making	*N/A*
10.1.6	Physical Responses	*B*
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2 For the skills rated "radically different", what is
the nature of the difference?

Question 10.3 For the skills rated "substantially different",
what is the nature of the difference?

10.1.6 Side-arm control

Question 10.4 For the skills rated "somewhat different", is the
difference enough to require a change in training
methods? If so, indicate the nature of the
difference.

New System _____ *ADOCS* _____

Question 11.1 What are the differences in crew interaction
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	*C*
11.1.2	Non-Verbal Exchange	*C*
11.1.3	Coordinated Physical Responses	*C*
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

More time head out of cockpit.

*Reduction of workload will make all of these tasks easier,
will permit more verbal exchange, better at spotting
targets - detecting threats.*

New System ___ADOCS_____

Question 12.1   In terms of <u>training methods</u>, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing <u>training</u>
difference instead of <u>system operation</u> differences,
i.e., differences in system operation might <u>not</u>
always necessitate differences in training methods.)

Training Areas	Degree of Difference
12.1.1 Basic Flying	C
12.1.2 Instrument Flying	B
12.1.3 Nap of Earth Flying	B
12.1.4 Navigation	N/A
12.1.5 Communications	N/A
12.1.6 Target Detection	N/A
12.1.7 Target Attack	N/A
12.1.8 Weapon Aiming and Firing . .	N/A
12.1.9 Air-to-Air Combat Flight Maneuvers	N/A
12.1.10 Air-to-Ground Combat Flight Maneuvers	D
12.1.11 Multiple Aircraft Operations	N/A
12.1.12 Reconnaissance	N/A
12.1.13 Command and Control Information Processing	N/A
12.1.14 Other (Specify)	
12.1.15 Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

12.1.2 - 12.1.3 Much easier, no need to coordinate controls

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

Question 13   As stated at the beginning of the questionnaire
the objective of this study is to identify new Army
aviation systems and system characteristics which
will require behavioral changes necessitating new
training techniques.

Given this objective, is there anything further
which you believe will require changes in training
as a result of the introduction of new Army aviation
systems?

ADOCS gives capabilities that you can't do today.

*Might be able to do so many more things that training would
have to include such tasks.   For instance, pick up container
out of ship, hold while ship is rolling.*

*Digital processing can be used to pick up laser or other
sensing cues, to position aircraft.*

QUESTIONNAIRE FOR UNIVERSITY OF DAYTON STUDY OF ARMY
AVIATION TRAINING R&D REQUIREMENTS
(ARMY RESEARCH INSTITUTE FIELD UNIT
CONTRACT NO. MDA903-80-C-0229

DATE_____27 May 1980_____   QUESTIONNAIRE NO._____11_____

RESPONDER'S NAME_____

RESPONDER'S ORGANIZATION_____

RESPONDER'S TITLE OR POSITION_____

The objective of this study is to identify new Army aviation systems and system characteristics which will require behavioral changes necessitating new training techniques.

Question 1   What new systems will be in the U.S. Army aviation inventory for the period of 1985 to 2000 (within your area of cognizance)?

　　　　1.1   _ADOCS (Advanced Digital Optical Control System)_

　　　　1.2   _IDSV (Integrated Digital Systems Validation_

　　　　1.3   _____

　　　　1.4   _____

Question 2   What are the probabilities that each of these new systems will be introduced into Army inventory? (Values of probability are defined as 1.0 = almost certain, 0.8 = highly probable, 0.6 = probable, 0.4 = uncertain, and 0.2 = highly unlikely.)

	New System	Probability
2.1	ADOCS	0.8
2.2	IDSV	0.4
2.3		
2.4		

Question 3   What are the scheduled years for introducing each
              of these new aviation systems?

	New System	Year
3.1	_ADOCS_	_1985_
3.2	_IDSV_	_early 1990's_
3.3		
3.4		

Question 4   How extensive will be the use of each of these new
              systems? (Degrees of use are defined as "a" = more
              than three thousand items, "b" = one to three thousand
              items, "c" = three hundred to one thousand items,
              "d" = one to three hundred items, and "e" = thirty
              to one hundred items.)

	New System	Degree of Use
4.1	_ADOCS_	_A_
4.2	_IDSV_	_A_
4.3		
4.4		

Question 5   What are the current systems, if any, to be replaced
              by each of these systems?

	New Systems	Current Systems
5.1	_ADOCS_	_Current hard-wire electronic system, primarily mechanical_
5.2	_IDSV_	_Integrate all currently separate controls and displays_
5.3		
5.4		

The questionnaire responder should answer Questions 6 to 12, on
separate sheets, for each of the new systems identified in the
answer to Question 1.

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New System _____*ADOCS*_____

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

Component	Degree of Difference
6.1.1 Flight Controls	A-B
6.1.2 Instruments	C
6.1.3 Displays	C
6.1.4 Power Controls	A
6.1.5 Seating Arrangement	D
6.1.6 Visibility	D
6.1.7 Weapon Guidance	D
6.1.8 Guns	D
6.1.9 Rockets	D
6.1.10 Laser	D
6.1.11 Threat Detection	D
6.1.12 Navigation	D
6.1.13 Communication	D
6.1.14 ECM/EW	D
6.1.15 Other (Specify)	
6.1.16 Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

> *6.1.1 Change from mechanical system to Fly-by-Fiber Optics Mechanical
> Activation to Electrical Actuation Signal Processor combining
> sensor information and pilot input*
> *6.1.4 Stick replaced by side-arm controller*

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

> *6.1.2 - 6.1.3 Changes from hydraulics and mechanical to optical
> will permit other types of sensors and displays*

New System _____ *ADOCS* _____

Question 7.1 How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	B
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	B
7.1.4	Flying Workload	B
7.1.5	Flight Safety Characteristics	B
7.1.6	Complexity	B
7.1.7	Speed	D
7.1.8	Target Detection Capabilities	B
7.1.9	Weapon Range	N/A
7.1.10	Weapon Accuracy	B
7.1.11	Troop Capacity	B
7.1.12	Cargo Capacity	B
7.1.13	Other (Specify) *Vulnerability*	B
7.1.14	Other (Specify) *Survivability*	B
7.1.15	Other (Specify) *Reliability*	B

Question 7.2 For the performances rated "radically different", what is the nature of the difference?

Question 7.3 For the performances rated "substantially different", what is the nature of the difference?

7.1.1 - 7.1.3 Flight control laws will be solved in much more precise manner
7.1.4 Workload reduced
7.1.5 Redundancy and reliability improve flight safety
(continued on attached)

Question 7.4 For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System_____ADOCS_____

Question 7.3 (Continued)

> 7.1.6   *Many more things can (will) be done for the pilot,*
>   *that he used to have to do himself.*
> 7.1.8   *Pilot is freer to look for targets*
> 7.1.10   *Improved weapon accuracy*
> 7.1.11 - 7.1.12 *Weight reduction*
> 7.1.13 - 7.1.15 *Don't depend on system connnection. Fault*
>   *isolation, self-correction, much smaller*
>   *redundancy.*

New System_____ *ADOCS* _____

Question 8.1   In terms of cockpit crew operations, how much
difference is there between the new system and
the current systems which it replaces? (Degrees
of difference are defined in Question 6.1).

	Operation	Degree of Difference
8.1.1	Basic Flying	B
8.1.2	Instrument Flying	B
8.1.3	Nap of Earth Flying	B
8.1.4	Navigation	D
8.1.5	Communication	D
8.1.6	Other (Specify)	
8.1.7	Other (Specify)	

Question 8.2   For the operations rated "radically different", what
is the nature of the difference?

Question 8.3   For the operations rated "substantially different",
what is the nature of the difference?

*8.1.1 - 8.1.3 Much simpler - tailor flight control response to
mission requirements - significant improvements
in stability - digital controls*

Question 8.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System_____ADOCS_____

Question 9.1   In terms of <u>combat operations tasks</u>, how much
difference is there between the new system and
current systems which it replaces? (Degrees of
difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	N/A
9.1.2	Target Attack	N/A
9.1.3	Weapon Aiming and Firing . . .	N/A
9.1.4	Air-to-Air Combat Flight Maneuvers	N/A
9.1.5	Air-to-Ground Combat Flight Maneuvers	D
9.1.6	Multiple Aircraft Operation .	N/A
9.1.7	Reconnaissance	N/A
9.1.8	Command and Control Information Processing	N/A
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2   For the operations rated "radically different", what
is the nature of the difference?

Question 9.3   For the operations rated "substantially different",
what is the nature of the difference?

Question 9.4   For the operations rated "somewhat different", is
the difference enough to require a change in
training methods? If so, indicate the nature of
the difference.

New System_____ADOCS_____

Question 10.1   What are the differences in <u>man-machine skill</u>
                <u>requirements</u> between the new system and the current
                systems which it replaces? (Degrees of difference
                are defined in Question 6.1).

	Skill Category	Degree of Difference
10.1.1	Monitoring Displays	N/A
10.1.2	Tracking Outside Aircraft . .	N/A
10.1.3	Recognition	N/A
10.1.4	Memory	N/A
10.1.5	Decision-Making	N/A
10.1.6	Physical Responses	B
10.1.7	Other (Specify)	
10.1.8	Other (Specify)	

Question 10.2   For the skills rated "radically different", what is
                the nature of the difference?

Question 10.3   For the skills rated "substantially different",
                what is the nature of the difference?

Question 10.4   For the skills rated "somewhat different", is the
                difference enough to require a change in training
                methods? If so, indicate the nature of the
                difference.

New System _____ *ADOCS* _____

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	_C_
11.1.2	Non-Verbal Exchange	_C_
11.1.3	Coordinated Physical Responses	_C_
11.1.4	Other (Specify)	___
11.1.5	Other (Specify)	___

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

New System _____ADOCS_____

Question 12.1   In terms of training methods, how much difference
will there be between the new system and the current
systems it replaces? (Note that this differs from
Questions 8.1 and 9.1, by emphasizing training
difference instead of system operation differences,
i.e., differences in system operation might not
always necessitate differences in training methods.)

	Training Areas	Degree of Difference
12.1.1	Basic Flying	C
12.1.2	Instrument Flying	B
12.1.3	Nap of Earth Flying	B
12.1.4	Navigation	N/A
12.1.5	Communications	N/A
12.1.6	Target Detection	N/A
12.1.7	Target Attack	N/A
12.1.8	Weapon Aiming and Firing . .	N/A
12.1.9	Air-to-Air Combat Flight Maneuvers	N/A
12.1.10	Air-to-Ground Combat Flight Maneuvers	D
12.1.11	Multiple Aircraft Operations	N/A
12.1.12	Reconnaissance	N/A
12.1.13	Command and Control Information Processing	N/A
12.1.14	Other (Specify)	
12.1.15	Other (Specify)	

Question 12.2   For the training areas rated "radically different",
what is the nature of the difference?

Question 12.3   For the training areas rated "substantially different",
what is the nature of the difference?

Question 12.4   For the training areas rated "somewhat different",
what is the nature of the difference?

New System _____ *IDSV*_____

Question 6.1   How much difference will there be between the new
system and the current systems which it replaces
in terms of <u>physical characteristics</u>? (Degrees of
difference are defined as: "a" = radically different;
"b" = substantially different; "c" = somewhat
different; and "d" = minimal or no difference.)

	<u>Component</u>	<u>Degree of Difference</u>
6.1.1	Flight Controls	*A*
6.1.2	Instruments	*A*
6.1.3	Displays	*A*
6.1.4	Power Controls	*B*
6.1.5	Seating Arrangement	*D*
6.1.6	Visibility	*B*
6.1.7	Weapon Guidance	*B*
6.1.8	Guns	*B*
6.1.9	Rockets	*B*
6.1.10	Laser	*N/A*
6.1.11	Threat Detection	*A*
6.1.12	Navigation	*B*
6.1.13	Communication	*B*
6.1.14	ECM/EW	*D*
6.1.15	Other (Specify)	
6.1.16	Other (Specify)	

Question 6.2   For the components rated "radically different", what
is the nature of the difference?

> *6.1.3   Two CRTs to replace all dials, etc.*
> *6.1.11 Commanded evasive maneuver*

Question 6.3   For the components rated "substantially different",
what is the nature of the difference?

> *6.1.7 - 6.1.9 Integrated systems   6.1.13 Command and control*
> *6.1.6   Head-up-display   information on CRT*
> *6.1.12 Map display CRT*

Question 6.4   For the components rated "somewhat different", is
the difference enough to require a change in training
methods? If so, indicate the nature of the difference.

New System   *IDSV*

Question 7.1   How much performance difference will there be between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Performance	Degree of Difference
7.1.1	Maneuverability	B
7.1.2	Flight Stability	B
7.1.3	Control Responsiveness . .	B
7.1.4	Flying Workload	B
7.1.5	Flight Safety Characteristics	B
7.1.6	Complexity	B
7.1.7	Speed	N/A
7.1.8	Target Detection Capabilities	B
7.1.9	Weapon Range	N/A
7.1.10	Weapon Accuracy	D
7.1.11	Troop Capacity	C
7.1.12	Cargo Capacity	C
7.1.13	Other (Specify)	
7.1.14	Other (Specify)	

Question 7.2   For the performances rated "radically different", what is the nature of the difference?

Question 7.3   For the performances rated "substantially different", what is the nature of the difference?

    7.1.1 - 7.1.6   Refer to responses by Fred Cappetta on IDSV
    7.1.8   Automation and head-out-cockpit

Question 7.4   For the performances rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

    7.1.11 - 7.1.12   Reduced weight about 400 pounds

New System ___IDSV_____

Question 8.1   In terms of <u>cockpit crew operations</u>, how much difference is there between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Operation	Degree of Difference
8.1.1 Basic Flying	B
8.1.2 Instrument Flying	B
8.1.3 Nap of Earth Flying	B
8.1.4 Navigation	B
8.1.5 Communication	B
8.1.6 Other (Specify)	
8.1.7 Other (Specify)	

Question 8.2   For the operations rated "radically different", what is the nature of the difference?

Question 8.3   For the operations rated "substantially different", what is the nature of the difference?

8.1.1   Easier to fly
8.1.4   Inertial, Doppler for wire detection and navigation, computer graphic map displays
8.1.5   IACS (Integrated Avionics Control System)

Question 8.4   For the operations rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System _____ *IDSV* _____

Question 9.1 In terms of <u>combat operations tasks</u>, how much difference is there between the new system and current systems which it replaces? (Degrees of difference are defined in Question 6.1).

	Operation	Degree of Difference
9.1.1	Target Detection	A
9.1.2	Target Attack	A
9.1.3	Weapon Aiming and Firing . . .	A
9.1.4	Air-to-Air Combat Flight Maneuvers	A
9.1.5	Air-to-Ground Combat Flight Maneuvers	A
9.1.6	Multiple Aircraft Operation .	B
9.1.7	Reconnaissance	B
9.1.8	Command and Control Information Processing	B
9.1.9	Other (Specify)	
9.1.10	Other (Specify)	

Question 9.2 For the operations rated "radically different", what is the nature of the difference?

9.1.1 Cueing and head-out of cockpit
9.1.2 - 9.1.3 Pilot is relieved of many masked flying acts

Question 9.3 For the operations rated "substantially different", what is the nature of the difference?

9.1.6 Easier
9.1.7 Head-out of cockpit
9.1.8 Automated information processing. Less verbal communication. Automatic fixing of aircraft position and notification to other aircraft from inertial and Doppler.

Question 9.4 For the operations rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

New System   ' *IDSV*

Question 10.1   What are the differences in <u>man-machine skill requirements</u> between the new system and the current systems which it replaces? (Degrees of difference are defined in Question 6.1).

Skill Category	Degree of Difference
10.1.1 Monitoring Displays	B
10.1.2 Tracking Outside Aircraft . .	B
10.1.3 Recognition	C
10.1.4 Memory	B
10.1.5 Decision-Making	B
10.1.6 Physical Responses	B
10.1.7 Other (Specify)	A
10.1.8 Other (Specify)	

Question 10.2   For the skills rated "radically different", what is the nature of the difference?

10.1.7 Expansion of critical information on CRT

Question 10.3   For the skills rated "substantially different", what is the nature of the difference?

10.1.1 Easier
10.1.2 Much more freedom
10.1.4 Much less requirement
10.1.5 Pilot does more new decision-making, routine decisions will be done by system
10.1.6 Much reduced workload, much less physical strength

Question 10.4   For the skills rated "somewhat different", is the difference enough to require a change in training methods? If so, indicate the nature of the difference.

10.1.3 Synergistic effect of system

New System _____ *IDSV* _____

Question 11.1 What are the differences in <u>crew interaction</u>
requirements between the new system and the current
systems which it replaces? (Degrees of difference
are defined in Question 6.1).

	Interaction Category	Degree of Difference
11.1.1	Verbal Exchange	*B*
11.1.2	Non-Verbal Exchange	*B*
11.1.3	Coordinated Physical Responses	*C*
11.1.4	Other (Specify)	
11.1.5	Other (Specify)	

Question 11.2 For the interactions rated "radically different",
what is the nature of the difference?

Question 11.3 For the interactions rated "substantially different",
what is the nature of the difference?

   *11.1.1 Less verbal discussion by switching images from
          one display to another*
   11.1.2 Cueing to display

Question 11.4 For the interactions rated "somewhat different",
is the difference enough to require a change in
training methods?

   *11.1.3 Automation would reduce requirements for physical
          coordination such as weapon aiming versus flying*

New System _____IDSV_____

Question 12.1   In terms of <u>training methods</u>, how much difference
                 will there be between the new system and the current
                 systems it replaces? (Note that this differs from
                 Questions 8.1 and 9.1, by emphasizing <u>training</u>
                 difference instead of <u>system operation</u> differences,
                 i.e., differences in system operation might <u>not</u>
                 always necessitate differences in training methods.)

	<u>Training Areas</u>	<u>Degree of Difference</u>
12.1.1	Basic Flying	B
12.1.2	Instrument Flying	B
12.1.3	Nap of Earth Flying	B
12.1.4	Navigation	B
12.1.5	Communications	B
12.1.6	Target Detection	A
12.1.7	Target Attack	A
12.1.8	Weapon Aiming and Firing . .	A
12.1.9	Air-to-Air Combat Flight Maneuvers	A
12.1.10	Air-to-Ground Combat Flight Maneuvers	A
12.1.11	Multiple Aircraft Operations	B
12.1.12	Reconnaissance	B
12.1.13	Command and Control Information Processing	B
12.1.14	Other (Specify) *Cargo Operations*	A
12.1.15	Other (Specify) *Attack targets across the FEBA*	A
12.1.16	Other (Specify) *Rescue Operations*	B

Question 12.2   For the training areas rated "radically different",
                 what is the nature of the difference?

                 12.1.9 - 12.1.10 More time available

Question 12.3   For the training areas rated "substantially different",
                 what is the nature of the difference?

                 *12.1.1 Less skill required. Physical lower level jobs reduced, i.e.,
                          flying skill coordination requirement. Physical higher level
                          jobs increased to fill workload. More teaching possible in
                          in the same length of time.*

Question 12.4   For the training areas rated "somewhat different",
                 what is the nature of the difference?

Question 13   As stated at the beginning of the questionnaire
              the objective of this study is to identify new Army
              aviation systems and system characteristics which
              will require behavioral changes necessitating new
              training techniques.

              Given this objective, is there anything further
              which you believe will require changes in training
              as a result of the introduction of new Army aviation
              systems?

APPENDIX B
SCORING MODEL WEIGHTS

TABLE B-1

NUMERICAL CONVERSION OF QUESTIONNAIRE ANSWERS

Question 3

Year	Numerical Scale
1980-1983	1.0
1984-1987	.9
1988-1991	.8
1992-1995	.6
1996-2000	.4

Question 4

Degree of Difference	Numerical Scale
A	1.0
B	.8
C	.6
D	.4
E	.2

Question 6-12

Degree of Difference	Numerical Scale
A	1.0
B	.5
C	.2
D	.0
N/A	.0

TABLE B-2

WEIGHT OF COMPONENT IMPORTANCE

Question 6		Component	Importance
	6.1.1	Flight Controls	.8
	6.1.2	Instruments	.5
	6.1.3	Displays	.8
	6.1.4	Power Controls	.5
	6.1.5	Seating Arrangement	.4
	6.1.6	Visibility	.5
	6.1.7	Weapon Guidance	.5
	6.1.8	Guns	.3
	6.1.9	Rockets	.2
	6.1.10	Laser	.5
	6.1.11	Threat Detection	.2
	6.1.12	Navigation	.3
	6.1.13	Communication	.3
	6.1.14	ECM/EW	.2
	6.1.15	Other (Specify)	.6
	6.1.16	Other (Specify)	.4

Question 7		Performance	Importance
	7.1.1	Maneuverability	.7
	7.1.2	Flight Stability	.6
	7.1.3	Control Responsiveness	.7
	7.1.4	Flying Workload	1.0
	7.1.5	Flight Safety Characteristics	.5
	7.1.6	Complexity	.3
	7.1.7	Speed	.2
	7.1.8	Target Detection Capabilities	.6
	7.1.9	Weapon Range	.1
	7.1.10	Weapon Accuracy	.1
	7.1.11	Troop Capacity	.1

TABLE B-2   (Continued)

	Performance	Importance
7.1.12	Cargo Capacity	.1
7.1.13	Other (Specify)	.6
7.1.14	Other (Specify)	.4

Question 8	Operation	Importance
8.1.1	Basic Flying	.5
8.1.2	Instrument Flying	.5
8.1.3	Nap of Earth Flying	1.0
8.1.4	Navigation	.3
8.1.5	Communication	.2
8.1.6	Other (Specify)	.6
8.1.7	Other (Specify)	.4

Question 9	Operation	Importance
9.1.1	Target Detection	.3
9.1.2	Target Attack	.4
9.1.3	Weapon Aiming and Firing	.3
9.1.4	Air-to-Air Combat Flight Maneuvers	.5
9.1.5	Air-to-Ground Combat Flight Maneuvers	1.0
9.1.6	Multiple Aircraft Operation	.2
9.1.7	Reconnaissance	.4
9.1.8	Command and Control Information Processing	.4
9.1.9	Other (Specify)	.6
9.1.10	Other (Specify)	.4

Question 10	Skill Category	Importance
10.1.1	Monitoring Displays	.5
10.1.2	Tracking Outside Aircraft	.5
10.1.3	Recognition	.2

	Skill Category	Importance
10.1.4	Memory	.3
10.1.5	Decision-Making	1.0
10.1.6	Physical Responses	.5
10.1.7	Other (Specify)	.6
10.1.8	Other (Specify)	.4

Question 11	Interaction Category	Importance
11.1.1	Verbal Exchange	.1
11.1.2	Non-Verbal Exchange	.6
11.1.3	Coordinated Physical Responses . . .	.3
11.1.4	Other (Specify)	.6
11.1.5	Other (Specify)	.4

Question 12	Training Areas	Importance
12.1.1	Basic Flying	.5
12.1.2	Instrument Flying	.5
12.1.3	Nap of Earth Flying	1.0
12.1.4	Navigation	.3
12.1.5	Communications	.2
12.1.6	Target Detection	.3
12.1.7	Target Attack	.4
12.1.8	Weapon Aiming and Firing	.3
12.1.9	Air-to-Air Combat Flight Maneuvers .	.5
12.1.10	Air-to-Ground Combat Flight Maneuvers	1.0
12.1.11	Multiple Aircraft Operations	.2
12.1.12	Reconnaissance	.4
12.1.13	Command and Control Information Processing	.4
12.1.14	Other (Specify)	.6
12.1.15	Other (Specify)	.4

Note 1: Scale of importance for each element ranges from 0.1
         to 1.0.
Note 2: Scale of importance for each additional element under
         OTHER followed the reserved two spaces for OTHER is 0.4.

APPENDIX C
ADJUSTMENTS OF QUESTIONNAIRE ANSWERS

TABLE C-1

ADJUSTMENTS OF QUESTIONNAIRE ANSWERS IN THE SCORING MODEL ANALYSIS

Questionnaire No.	System No.	Question No.	Reported Answer	Modified Answer	Justification
1	5	8.1.3	B	C	Reflect more accurate rating for the complete scout helicopter. The synthesized questionnaire selected the highest rating from all subsystems of the near-term scout helicopter to represent the rating of the complete scout helicopter.
		8.1.4	B	C	
		8.1.6	A	C	
		8.1.7	A	C	
		9.1.2	D	A	
		9.1.5	D	A	
		10.1.1	B	A	
		10.1.5	C	B	
2	1	6.1.2	B	A	The respondent tends to have a lower rating on the question than the other two interviewees do. It is reasonable to make the answer consistent with others.
	1	6.1.3	B	A	Same reason as above.
	1	6.1.5	D	C	The reported answer was given under the assumption of no change in the one-person or two-person seat configuration. The modified answer allows the possibility for such change.

Questionnaire No.	System No.	Question No.	Reported Answer	Modified Answer	Justification
2	1	6.1.7	N/A	B	MMS and Fire and Forget features might have not been considered in the inter-viewer's judgment.
4	3	6.1.2	B	C	Use the similar base that other inter-viewees do.
		6.1.3	B	C	Use the similar base that other inter-viewees do.
		6.1.10	B	D	It is laser detector, not laser weapon. Therefore, it should not be sub-stantially different.
		6.1.13	B	D	Communication equipment does not appear to be substantially different.
5	15	9.1.2	A	D	We believe that another respondent to this subsystem, a pilot, has a better understanding of combat operation tasks. Thus, the answer is modified to conform the pilot's opinion.
		9.1.5	B	D	Same reason as above.
		9.1.7	A	C	Same reason as above.
7	4	6.1.3	C	A	PNVS is believed to have a strong impact.
		6.1.16	A	Deleted	A redundant item to the one specified in 6.1.15 (PNVS).

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TABLE C-1 (Continued)

Questionaire No.	System No.	Question No.	Reported Answer	Modified Answer	Justification
		6.1.17	A	Deleted	A redundant item to the one specified in 6.1.15 (PNVS).
		9.1.4	N/A	A	Assume a multi-purpose light-weight missile system is used.
		10.1.2	D	A	Brabson's answer reflects a more reasonable rating.
8	1	4.1	A	B	Based on the current Army aviation inventory information.
		8.1.3	A	B	Overrated the degree of difference in the NOE operation in terms of cockpit crew operations.
		8.1.7	A	D	NBC operations' affect in cockpit crew operations is important. But the affect is the same on present, near-term and far-term scout helicopters. Therefore, D is an appropriate answer.
		8.1.8	C	D	Similiar reason as above.
		8.1.9	B	D	Similiar reason as above.
9	4	6.1.1	A	B	The interviewee rated A and D for the co-pilot and the pilot, respectively. An intermediate rating, B, is a better answer to the question.

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TABLE C-1 (Continued)

Questionnaire No.	System No.	Question No.	Reported Answer	Modified Answer	Justification
		8.1.3	A	B	NOE operations do not create drastic differences in cockpit crew operations. The modified answer agrees with the one given by a pilot.
		8.1.6	A	D	The interviewee indicated that Fault Detection Isolation System would make a drastic difference in cockpit operations by the co-pilot/gunner. He indicated no difference in the pilot operation. Therefore, the modified answer, which agrees with the answer by a pilot, is appropriate for the scoring model analysis.
		10.1.7	A	Deleted	Extra item identified by the interviewee. Tend to indicate a higher weight in the scoring model analysis.
		10.1.8	A	Deleted	Extra item identified by the interviewee. Tend to indicate a higher weight in the scoring model analysis.
10	16	4.1	C	A	Base on the current Army aviation inventory information.

APPENDIX D
WEIGHTED SCORES FOR SURVEY QUESTIONS 6 THROUGH 12

The scoring model analysis pointed out the relative overall importance of the various systems and subsystems planned to meet future Army aviation needs. It also indicated the relative importance of basic factors relevant to training differences between current and future systems/subsystems. Each of the factor scores for questions 6 through 12 is actually composed of interview responses to the several parts of each question. The factor score is thus a summation of the answers to each part of the questions which is the basis for the factor. These parts of each question are identified as "elements" in the discussion which follows. The "elements" differ from question to question, and include system components, characteristics, and operating functions.

For example, the first "element" (6.1.1) of question 6 asks "How much difference will there be in 'Flight Controls' between the new system and current systems?" Weights were assigned to the elements of each question as indicated in Appendix B, Table B-2. These weights were established by the authors, based on impressions gathered in the survey. Continuing with the above example, "Flight Controls" was given a weight of 0.8 on a scale of 1.0, indicating that it was a relatively important element in question 6. The numerical conversions (per Appendix B, Table B-1) of the questionnaire responses for each element were multiplied by these weights. These weighted scores are given for each element of questions 6 through 12, for each questionnaire in Tables D-1 through D-14. The line identified as QSN #2, SYS #1, on Table D-1, continues the example for the element "Flight Control". The respondent on this questionnaire stated that "Flight Controls" for System #1 (Far Term Scout) would be "radically different" from current systems. The numerical conversion of this statement was a score of 1.0, which when multiplied by the assigned weight of 0.8, gives the weighted score 0.80, as shown in the table. Carrying across the row, the weighted scores are given for each element of question #6.

The averages of the element scores of the three respondents for System #1 are shown in the line identified as "AVE1" on the table. The scores in the "AVE2" lines are the products of the "AVE1" scores and the average of the measure "System Importance". Answers to questions 2, 3, and 4 provided the basis for the "System Importance" measure. This measure, as described in detail in Volume I, combines "probability of system introduction", "scheduled date of introduction", and "extensiveness of system use". Therefore the scores in the "AVE2" lines represent the relative importance of each element in each system in terms of the difference between that element in the new system versus the same element in current systems, combined with the importance of the system itself. Thus the first entry (0.14) in the "AVE2" line for System #1 comes from the multiplication of 0.80 in the "AVE1" line by 0.17, the measure of system importance for System #1.

The measures of system importance, M-1, for the five systems, as reported in Section 5, Volume I, are as follows:

System No.

1	Far Term Scout	0.17
2	SEMA-X	0.17
3	Black Hawk	0.80
4	Advance Attack Helicopter (AH64)	0.43
5	Near Term Scout	0.45

The summation of AVE2 rows for each element is a weighted score
(WTGD SCORE) which indicates the relative importance of each element to behavioral
research in relation to all systems or all subsystems. These weighted scores
are shown in Tables D-1 through D-7 for all systems, and in Tables D-8 through
D-14 for all subsystems.

The three elements having the highest weighted scores for systems, and
the three having the highest weighted scores for subsystems, were considered
the most important contributors to training differences. These elements were
reported in Section 6, Volume I. For example, the element "Displays", with a
weighted score of 1.20 for systems and 1.13 for subsystems, was the most
important element in question 6, concerning the differences in "physical
characteristics". This procedure identifies those elements common to all
systems/subsystems which are likely to have the greatest bearing on changes
in training requirements and consequent needs for behavioral research.

Elements requiring different or new training for individual aviation
systems/subsystems can also be identified from these tables. Each system/
subsystem will have its own set of major elements which will require different
or new training. These findings are synopsized in Section 6 of Volume I.

TABLE D-1

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 6

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 6

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.80	0.50	0.80	0.25	0.08	0.00	0.25	0.00	0.00	0.00	0.20	0.15	0.15	0.10	0.00	0.00	0.00	0.00	3.28
3	1	0.80	0.50	0.80	0.10	0.08	0.00	0.50	0.30	0.20	0.50	0.20	0.30	0.30	0.20	0.00	0.00	0.00	0.00	4.78
8	1	0.80	0.50	0.80	0.50	0.40	0.50	0.25	0.00	0.00	0.50	0.20	0.30	0.30	0.04	0.40	0.00	0.00	0.00	5.29
AVE1	1	0.80	0.50	0.80	0.28	0.19	0.17	0.33	0.10	0.07	0.17	0.20	0.25	0.25	0.11	0.13	0.00	0.00	0.00	4.45
AVE2	1	0.14	0.09	0.14	0.05	0.03	0.03	0.06	0.02	0.01	0.03	0.03	0.04	0.04	0.02	0.02	0.00	0.00	0.00	0.77
2	2	0.80	0.50	0.80	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.30	0.30	0.10	0.00	0.00	0.00	0.00	3.40
8	2	0.80	0.50	0.80	0.25	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.15	0.06	0.10	0.20	0.00	0.00	0.00	3.36
AVE1	2	0.80	0.50	0.80	0.38	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.23	0.18	0.10	0.10	0.00	0.00	0.00	3.38
AVE2	2	0.13	0.08	0.13	0.06	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.03	0.02	0.02	0.00	0.00	0.00	0.57
4	3	0.40	0.10	0.40	0.10	0.00	0.10	0.25	0.15	0.10	0.00	0.10	0.15	0.00	0.10	0.30	0.20	0.00	0.00	2.45
AVE1	3	0.40	0.10	0.40	0.10	0.00	0.10	0.25	0.15	0.10	0.00	0.10	0.15	0.00	0.10	0.30	0.20	0.00	0.00	2.45
AVE2	3	0.32	0.08	0.32	0.08	0.00	0.08	0.20	0.12	0.08	0.00	0.08	0.12	0.00	0.08	0.24	0.16	0.00	0.00	1.96
7	4	0.00	0.10	0.80	0.00	0.00	0.00	0.25	0.00	0.00	0.10	0.04	0.00	0.00	0.00	0.60	0.00	0.00	0.00	1.89
9	4	0.40	0.10	0.80	0.10	0.00	0.00	0.25	0.00	0.04	0.00	0.10	0.00	0.00	0.00	0.60	0.00	0.00	0.00	2.39
AVE1	4	0.20	0.10	0.80	0.05	0.00	0.00	0.25	0.00	0.02	0.05	0.07	0.00	0.00	0.00	0.60	0.00	0.00	0.00	2.14
AVE2	4	0.09	0.04	0.35	0.02	0.00	0.00	0.11	0.00	0.01	0.02	0.03	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.92
1	5	0.00	0.25	0.40	0.00	0.00	0.00	0.50	0.30	0.20	0.50	0.04	0.15	0.00	0.00	0.00	0.00	0.00	0.00	2.34
3	5	0.00	0.00	0.80	0.00	0.00	0.00	0.10	0.04	0.04	0.25	0.10	0.06	0.06	0.04	0.12	0.20	0.00	0.00	1.83
AVE1	5	0.00	0.13	0.60	0.00	0.00	0.00	0.30	0.18	0.12	0.38	0.07	0.11	0.03	0.02	0.06	0.10	0.00	0.00	2.09
AVE2	5	0.00	0.06	0.27	0.00	0.00	0.00	0.13	0.08	0.05	0.17	0.03	0.05	0.01	0.01	0.03	0.04	0.00	0.00	0.93
WTGD SCORE		0.68	0.35	1.20	0.21	0.03	0.11	0.50	0.22	0.15	0.23	0.19	0.25	0.09	0.13	0.57	0.24	0.00	0.00	5.15

Question 6. How much difference will there be between the new system and the current systems which it replaces in terms of physical characteristics?

Element

1.1 Flight Controls
1.2 Instruments
1.3 Displays
1.4 Power Controls
1.5 Seating Arrangement
1.6 Visibility
1.7 Weapon Guidance
1.8 Guns
1.9 Rockets
1.10 Laser
1.11 Threat Detection
1.12 Navigation
1.13 Communication
1.14 ECM/EW
1.15 Other (Specify)
1.16 Other (Specify)
1.17 Other (Specify)
1.18 Other (Specify)

System #	Description
1	Far-term Scout Helicopter
2	SEMA-X Aircraft
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

TABLE D-2

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 7

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.35	0.00	0.35	1.00	0.50	0.15	0.00	0.30	0.10	0.10	0.02	0.00	0.30	0.20	0.00	0.00	0.00	0.00	3.37
3	1	0.35	0.30	0.35	1.00	0.25	0.15	0.10	0.60	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.30
8	1	0.70	0.30	0.70	1.00	0.10	0.06	0.20	0.30	0.05	0.05	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	3.46
AVE1	1	0.47	0.20	0.47	1.00	0.28	0.12	0.10	0.40	0.08	0.08	0.01	0.00	0.10	0.07	0.00	0.00	0.00	0.00	3.38
AVE2	1	0.08	0.03	0.08	0.17	0.05	0.02	0.02	0.07	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.58
2	2	0.70	0.60	0.70	0.50	0.00	0.30	0.20	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	3.30
8	2	0.00	0.30	0.00	0.50	0.10	0.15	0.00	0.60	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	1.77
AVE1	2	0.35	0.45	0.35	0.50	0.05	0.23	0.10	0.30	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	2.53
AVE2	2	0.06	0.08	0.06	0.08	0.01	0.04	0.02	0.05	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.43
4	3	0.35	0.30	0.35	0.50	0.00	0.15	0.10	0.30	0.05	0.05	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	2.17
AVE1	3	0.35	0.30	0.35	0.50	0.00	0.15	0.10	0.30	0.05	0.05	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	2.17
AVE2	3	0.28	0.24	0.28	0.40	0.00	0.12	0.08	0.24	0.04	0.04	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.74
7	4	0.35	0.12	0.35	0.20	0.10	0.15	0.04	0.60	0.05	0.00	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	2.03
9	4	0.35	0.00	0.35	0.50	0.50	0.15	0.04	0.60	0.05	0.02	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	3.16
AVE1	4	0.35	0.06	0.35	0.35	0.30	0.15	0.04	0.60	0.05	0.01	0.03	0.01	0.30	0.00	0.00	0.00	0.00	0.00	2.60
AVE2	4	0.15	0.03	0.15	0.15	0.13	0.06	0.02	0.26	0.02	0.00	0.01	0.00	0.13	0.00	0.00	0.00	0.00	0.00	1.12
1	5	0.00	0.00	0.00	0.50	0.00	0.06	0.00	0.60	0.10	0.10	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	1.66
3	5	0.00	0.00	0.00	0.50	0.00	0.06	0.00	0.30	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
AVE1	5	0.00	0.00	0.00	0.50	0.00	0.06	0.00	0.45	0.03	0.08	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	1.31
AVE2	5	0.00	0.00	0.00	0.22	0.00	0.03	0.00	0.20	0.03	0.03	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.58
WTGD SCORE		0.57	0.36	0.57	1.03	0.19	0.27	0.13	0.82	0.11	0.09	0.01	0.02	0.25	0.01	0.00	0.00	0.00	0.00	4.45

Question 7. How much performance difference will there be between the new system and the current systems which it replaces?

Element

1.1	Maneuverability
1.2	Flight Stability
1.3	Control Responsiveness
1.4	Flying Workload
1.5	Flight Safety Characteristics
1.6	Complexity
1.7	Speed
1.8	Target Detection Capabilities
1.9	Weapon Range
1.10	Weapon Accuracy
1.11	Troop Capacity
1.12	Cargo Capacity
1.13	Other (Specify)
1.14	Other (Specify)

System #	Description
1	Far-term Scount Helicopter
2	SEMA-X Aircraft
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

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TABLE D-3

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 8

GSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.00	0.00	0.00	0.06	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66
3	1	0.00	0.10	0.50	0.15	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85
8	1	0.10	0.25	0.50	0.15	0.04	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.16
AVE1	1	0.03	0.12	0.33	0.12	0.05	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89
AVE2	1	0.01	0.02	0.06	0.02	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
2	2	0.10	0.10	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
8	2	0.25	0.00	0.00	0.15	0.10	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62
AVE1	2	0.17	0.05	0.00	0.15	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49
AVE2	2	0.03	0.01	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
3	3	0.25	0.25	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
AVE1	3	0.25	0.25	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
AVE2	3	0.20	0.20	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52
7	4	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
9	4	0.00	0.10	0.50	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68
AVE1	4	0.00	0.05	0.50	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59
AVE2	4	0.00	0.02	0.22	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
1	5	0.00	0.00	0.12	0.03	0.00	0.12	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
3	5	0.00	0.00	0.00	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE1	5	0.00	0.00	0.06	0.05	0.02	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
AVE2	5	0.00	0.00	0.03	0.02	0.01	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
WTGD SCORE		0.24	0.25	0.30	0.19	0.03	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11

Question 8. In terms of cockpit crew operations, how much difference is there between the new system and the current systems which it replaces?

Element
1.1 Basic Flying
1.2 Instrument Flying
1.3 Nap of Earth Flying
1.4 Navigation
1.5 Communication
1.6 Other (Specify)
1.7 Other (Specify)

System #	Description
1	Far-term Scout Helicopter
2	SEMA-X Aircraft
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

TABLE D-4

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 9

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.30	0.40	0.30	0.50	0.00	0.00	0.00	0.20	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30
3	1	0.30	0.40	0.30	0.50	1.00	0.20	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50
8	1	0.15	0.40	0.30	0.50	0.50	0.04	0.08	0.20	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.77
AVE1	1	0.25	0.40	0.30	0.50	0.50	0.08	0.16	0.27	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.86
AVE2	1	0.04	0.07	0.05	0.09	0.09	0.01	0.03	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49
2	2	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
8	2	0.30	0.00	0.00	0.00	0.00	0.04	0.20	0.20	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86
AVE1	2	0.30	0.00	0.00	0.00	0.00	0.02	0.10	0.30	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
AVE2	2	0.05	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
4	3	0.15	0.20	0.15	0.00	0.20	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20
AVE1	3	0.15	0.20	0.15	0.00	0.20	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20
AVE2	3	0.12	0.16	0.12	0.00	0.16	0.08	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
7	4	0.15	0.00	0.06	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71
9	4	0.30	0.08	0.06	0.50	0.20	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22
AVE1	4	0.23	0.04	0.06	0.50	0.10	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97
AVE2	4	0.10	0.02	0.03	0.22	0.04	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
1	5	0.30	0.40	0.15	0.50	1.00	0.04	0.08	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.59
3	5	0.30	0.40	0.30	0.50	1.00	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00
AVE1	5	0.30	0.40	0.23	0.50	1.00	0.07	0.14	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80
AVE2	5	0.13	0.18	0.10	0.22	0.45	0.03	0.06	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
WTGD SCORE		0.44	0.42	0.30	0.52	0.73	0.13	0.27	0.32	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.24

Question 9. In terms of combat operations tasks, how much difference is there between the new system and current systems which it replaces?

Element	
1.1	Target Detection
1.2	Target Attack
1.3	Weapon Aiming and Firing
1.4	Air-to-Air Combat Flight Maneuvers
1.5	Air-to-Ground Combat Flight Maneuvers
1.6	Multiple Aircraft Operation
1.7	Reconnaissance
1.8	Command and Control Information Processing
1.9	Other (Specify)
1.10	Other (Specify)

System #	Description
1	Far-term Scout Helicopter
2	SEMA-X Aircraft
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

TABLE D-5

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 10

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.25	0.25	0.10	0.15	0.20	0.10	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65
3	1	0.50	0.50	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
8	1	0.25	0.25	0.10	0.15	0.50	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35
AVE1	1	0.33	0.33	0.08	0.10	0.23	0.07	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35
AVE2	1	0.06	0.06	0.01	0.02	0.04	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
2	2	0.50	0.00	0.00	0.00	0.50	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10
8	2	0.10	0.00	0.00	0.06	0.50	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
AVE1	2	0.30	0.00	0.00	0.03	0.50	0.05	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03
AVE2	2	0.05	0.00	0.00	0.01	0.08	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
4	3	0.25	0.50	0.04	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54
AVE1	3	0.25	0.50	0.04	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54
AVE2	3	0.20	0.50	0.03	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43
7	4	0.25	0.50	0.10	0.15	0.20	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
9	4	0.50	0.50	0.00	0.15	0.50	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75
AVE1	4	0.38	0.50	0.05	0.15	0.35	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.53
AVE2	4	0.16	0.22	0.02	0.06	0.15	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66
1	5	0.50	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
3	5	0.50	0.00	0.04	0.15	0.50	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29
AVE1	5	0.50	0.00	0.02	0.08	0.50	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14
AVE2	5	0.22	0.00	0.01	0.03	0.22	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51
WTGD SCORE		0.69	0.27	0.08	0.12	0.50	0.29	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.01

Question 10. What are the differences in man-machine skill requirements between the new system and the current systems which it replaces?

Element

1.1 Monitoring Displays
1.2 Tracking Outside Aircraft
1.3 Recognition
1.4 Memory
1.5 Decision-Making
1.6 Physical Responses
1.7 Other (Specify)
1.8 Other (Specify)

System #	Description
1	Far-term Scout Helicopter
2	SEMA-X
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

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TABLE D-6

ELEMENT RATING VERSUS SYSTEM FOR QUESTION # 11

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
3	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	1	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE2	1	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	2	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
AVE1	2	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
AVE2	2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
4	3	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
AVE1	3	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
AVE2	3	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
7	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	4	0.02	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32
AVE1	4	0.01	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
AVE2	4	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1	5	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
3	5	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
AVE1	5	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE2	5	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
WIGD SCORE		0.02	0.35	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38

Question 11. What are the differences in crew interaction requirements between the new system and the current systems which it replaces?

Element

1.1 Verbal Exchange
1.2 Non-Verbal Exchange
1.3 Coordinated Physical Responses
1.4 Other (Specify)
1.5 Other (Specify)

System #	Description
1	Far-term Scout Helicopter
2	SEMA-X Aircraft
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

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TABLE D-7

ELEMENT RATING VERSUS <u>SYSTEM</u> FOR QUESTION # 12

GSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
2	1	0.10	0.25	0.00	0.06	0.10	0.15	0.40	0.30	0.50	1.00	0.04	0.08	0.40	0.00	0.00	0.00	0.00	0.00	3.38
3	1	0.50	0.10	0.20	0.06	0.04	0.30	0.40	0.30	0.50	1.00	0.04	0.40	0.40	0.00	0.00	0.00	0.00	0.00	4.24
8	1	0.25	0.25	0.50	0.15	0.04	0.15	0.40	0.30	0.50	0.50	0.04	0.08	0.20	0.00	0.00	0.00	0.00	0.00	3.36
AVE1	1	0.28	0.20	0.23	0.09	0.06	0.20	0.40	0.30	0.50	0.83	0.04	0.19	0.33	0.00	0.00	0.00	0.00	0.00	3.66
AVE2	1	0.05	0.03	0.04	0.02	0.01	0.03	0.07	0.05	0.09	0.14	0.01	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.63
2	2	0.25	0.00	0.00	0.06	0.04	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.20	0.03	0.00	0.00	0.00	0.00	1.05
8	2	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.12	0.00	0.00	0.00	0.00	0.38
AVE1	2	0.13	0.05	0.00	0.03	0.02	0.00	0.00	0.00	0.25	0.00	0.00	0.04	0.14	0.06	0.00	0.00	0.00	0.00	0.71
AVE2	2	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.12
4	3	0.00	0.10	0.00	0.00	0.00	0.15	0.20	0.15	0.25	0.50	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	1.85
AVE1	3	0.00	0.10	0.00	0.00	0.00	0.15	0.20	0.15	0.25	0.50	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	1.85
AVE2	3	0.00	0.08	0.00	0.00	0.00	0.12	0.14	0.12	0.20	0.40	0.08	0.16	0.16	0.00	0.00	0.00	0.00	0.00	1.48
7	4	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
9	4	0.10	0.00	0.50	0.00	0.04	0.06	0.08	0.06	0.50	0.20	0.00	0.00	0.08	0.30	0.08	0.08	0.00	0.00	2.08
AVE1	4	0.05	0.00	0.25	0.00	0.02	0.11	0.04	0.03	0.50	0.10	0.00	0.00	0.04	0.15	0.04	0.04	0.00	0.00	1.36
AVE2	4	0.02	0.00	0.11	0.00	0.01	0.05	0.02	0.01	0.22	0.04	0.00	0.00	0.02	0.06	0.02	0.02	0.00	0.00	0.59
1	5	0.00	0.00	0.00	0.06	0.00	0.06	0.00	0.15	0.10	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
3	5	0.00	0.10	0.20	0.06	0.04	0.15	0.20	0.15	0.50	1.00	0.04	0.20	0.08	0.00	0.00	0.00	0.00	0.00	2.72
AVE1	5	0.00	0.05	0.10	0.06	0.02	0.11	0.10	0.15	0.30	0.50	0.04	0.10	0.04	0.00	0.00	0.00	0.00	0.00	1.57
AVE2	5	0.00	0.02	0.04	0.03	0.01	0.05	0.04	0.07	0.13	0.22	0.02	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.70
WTGD SCORE		0.09	0.15	0.19	0.05	0.03	0.25	0.29	0.25	0.68	0.81	0.10	0.24	0.28	0.07	0.02	0.02	0.00	0.00	3.52

Question 12. In terms of training methods, how much difference will
there be between the new system and the current
systems it replaces?

Element

1.1 Basic Flying
1.2 Instrument Flying
1.3 Nap of Earth Flying
1.4 Navigation
1.5 Communications
1.6 Target Detection
1.7 Target Attack
1.8 Weapon Aiming and Firing

1.9 Air-to-Air Combat Flight
     Maneuvers
1.10 Air-to-Ground Combat
     Flight Maneuvers
1.11 Multiple Aircraft Operations
1.12 Reconnaissance
1.13 Command and Control Informa-
     tion Processing
1.14 Other (Specify)
1.15 Other (Specify)
1.16 Other (Specify)

System #	Description
1	Far-term Scout Helicopter
2	SEMA-X Aircraft
3	Black Hawk
4	Advanced Attack Helicopter
5	Near-term Scout Helicopter

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TABLE D-8

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 6

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.00	0.50	0.80	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	1.70
AVE1	11	0.00	0.50	0.80	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	1.70
AVE2	11	0.00	0.36	0.58	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	1.22
6	12	0.00	0.10	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
AVE1	12	0.00	0.10	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
AVE2	12	0.00	0.04	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
5	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
AVE1	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
AVE2	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
5	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
AVE1	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
AVE2	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1	15	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.15	0.00	0.10	0.00	0.00	0.00	0.00	1.25
5	15	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
AVE1	15	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.25	0.10	0.08	0.00	0.05	0.00	0.00	0.00	0.00	0.98
AVE2	15	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.10	0.04	0.06	0.00	0.04	0.00	0.00	0.00	0.00	0.39
10	16	0.80	0.25	0.40	0.25	0.20	0.25	0.25	0.06	0.04	0.00	0.00	0.15	0.15	0.10	0.60	0.40	0.00	0.00	3.90
11	16	0.80	0.10	0.16	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56
AVE1	16	0.80	0.17	0.28	0.38	0.10	0.13	0.13	0.03	0.02	0.00	0.00	0.08	0.08	0.05	0.30	0.20	0.00	0.00	2.73
AVE2	16	0.65	0.14	0.23	0.30	0.08	0.10	0.10	0.02	0.02	0.00	0.00	0.06	0.06	0.04	0.24	0.16	0.00	0.00	2.21
11	17	0.80	0.50	0.80	0.25	0.00	0.25	0.25	0.15	0.10	0.00	0.20	0.15	0.15	0.00	0.00	0.00	0.00	0.00	3.60
AVE1	17	0.80	0.50	0.80	0.25	0.00	0.25	0.25	0.15	0.10	0.00	0.20	0.15	0.15	0.00	0.00	0.00	0.00	0.00	3.60
AVE2	17	0.26	0.16	0.26	0.08	0.00	0.08	0.08	0.05	0.03	0.00	0.06	0.05	0.05	0.00	0.00	0.00	0.00	0.00	1.15
WTGD SCORE		0.90	0.75	1.13	0.38	0.08	0.46	0.28	0.14	0.08	0.10	0.10	0.22	0.11	0.04	0.24	0.16	0.00	0.00	5.19

Question 6.   How much difference will there be between the new system and the current systems which it replaces in terms of physical characteristics?

	Element		
1.1	Flight Controls	1.9	Rockets
1.2	Instruments	1.10	Laser
1.3	Displays	1.11	Threat Detection
1.4	Power Controls	1.12	Navigation
1.5	Seating Arrangement	1.13	Communication
1.6	Visibility	1.14	ECM/EW
1.7	Weapon Guidance	1.15	Other (Specify)
1.8	Guns	1.16	Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	TDSV

TABLE D-9

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 7

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.00	0.00	0.00	0.50	0.25	0.15	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.92
AVE1	11	0.00	0.00	0.00	0.50	0.25	0.15	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.92
AVE2	11	0.00	0.00	0.00	0.36	0.18	0.11	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.66
6	12	0.00	0.00	0.14	0.20	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
AVE1	12	0.00	0.00	0.14	0.20	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
AVE2	12	0.00	0.00	0.06	0.08	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
5	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE1	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE2	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
5	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
AVE1	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
AVE2	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1	15	0.00	0.00	0.00	0.50	0.00	0.06	0.00	0.60	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26
5	15	0.00	0.00	0.00	0.00	0.10	0.15	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85
AVE1	15	0.00	0.00	0.00	0.25	0.05	0.11	0.00	0.60	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06
AVE2	15	0.00	0.00	0.00	0.10	0.02	0.04	0.00	0.24	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43
10	16	0.35	0.00	0.14	0.50	0.25	0.15	0.00	0.00	0.00	0.02	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	1.76
11	16	0.35	0.30	0.35	0.50	0.25	0.15	0.00	0.30	0.00	0.05	0.05	0.05	0.30	0.20	0.20	0.00	0.00	0.00	3.05
AVE1	16	0.35	0.30	0.24	0.50	0.25	0.15	0.00	0.15	0.00	0.04	0.03	0.05	0.15	0.10	0.10	0.00	0.00	0.00	2.40
AVE2	16	0.28	0.24	0.20	0.41	0.20	0.12	0.00	0.12	0.00	0.03	0.02	0.04	0.12	0.08	0.08	0.00	0.00	0.00	1.95
11	17	0.35	0.30	0.35	0.50	0.25	0.15	0.00	0.30	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	2.24
AVE1	17	0.35	0.30	0.35	0.50	0.25	0.15	0.00	0.30	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	2.24
AVE2	17	0.11	0.10	0.11	0.16	0.08	0.05	0.00	0.10	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.72
WTGD SCORE		0.40	0.34	0.37	1.11	0.52	0.35	0.00	0.46	0.05	0.11	0.03	0.06	0.12	0.08	0.08	0.00	0.00	0.00	4.07

Question 7. How much performance difference will there be between the new system and the current systems which it replaces?

Element

1.1 Maneuverability
1.2 Flight Stability
1.3 Control Responsiveness
1.4 Flying Workload
1.5 Flight Safety Character-
1.6 Complexity
1.7 Speed
1.8 Target Detection Capabilities
1.9 Weapon Range
1.10 Weapon Accuracy
1.11 Troop Capacity
1.12 Cargo Capacity
1.13 Other (Specify)
1.14 Other (Specify)
1.15 Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	IDSV

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TABLE D-10

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 8

QGN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.00	0.25	1.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55
AVE1	11	0.00	0.25	1.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55
AVE2	11	0.00	0.18	0.72	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12
6	12	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE1	12	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE2	12	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
5	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	15	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
5	15	0.00	0.00	0.00	0.00	0.00	0.60	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80
AVE1	15	0.00	0.00	0.00	0.00	0.00	0.60	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
AVE2	15	0.00	0.00	0.00	0.00	0.00	0.24	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
10	16	0.25	0.25	0.50	0.15	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
11	16	0.25	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
AVE1	16	0.25	0.25	0.50	0.08	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13
AVE2	16	0.20	0.20	0.41	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91
11	17	0.25	0.25	0.50	0.15	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
AVE1	17	0.25	0.25	0.50	0.15	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
AVE2	17	0.08	0.08	0.16	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
WTGD SCORE		0.28	0.50	1.28	0.32	0.07	0.24	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.75

Question 8. In terms of cockpit crew operations, how much difference is there between the new system and the current systems which it replaces?

Element

1.1 Basic Flying
1.2 Instrument Flying
1.3 Nap of Earth Flying
1.4 Navigation
1.5 Communication
1.6 Other (Specify)
1.7 Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	IDSV

234

TABLE D-11

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 9

QSN#	BYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	13	0.00	0.20	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
AVE1	13	0.00	0.20	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
AVE2	13	0.00	0.15	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
5	14	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
AVE1	14	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
AVE2	14	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
1	15	0.30	0.00	0.15	0.00	0.00	0.04	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57
5	15	0.30	0.00	0.30	0.10	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
AVE1	15	0.30	0.00	0.23	0.05	0.00	0.02	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68
AVE2	15	0.12	0.00	0.09	0.02	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
10	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	17	0.30	0.40	0.30	0.50	1.00	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00
AVE1	17	0.30	0.40	0.30	0.50	1.00	0.10	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00
AVE2	17	0.10	0.13	0.10	0.16	0.32	0.03	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
WTGD SCORE		0.22	0.28	0.30	0.40	0.32	0.04	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.71

Question 9. In terms of combat operations tasks, how much difference is there between the new system and current systems which it replaces?

Element	
1.1	Target Detection
1.2	Target Attack
1.3	Weapon Aiming and Firing
1.4	Air-to-Air Combat Flight Maneuvers
1.5	Air-to-Ground Combat Flight Maneuvers
1.6	Multiple Aircraft Operation
1.7	Reconnaissance
1.8	Command and Control Information Processing
1.9	Other (Specify)
1.10	Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	IDSV

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TABLE D-12

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 10

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.25	0.00	0.10	0.15	0.50	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
AVE1	11	0.25	0.00	0.10	0.15	0.50	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25
AVE2	11	0.18	0.00	0.07	0.11	0.36	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90
6	12	0.10	0.00	0.00	0.00	0.20	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
AVE1	12	0.10	0.00	0.00	0.00	0.20	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
AVE2	12	0.04	0.00	0.00	0.00	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
5	13	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
AVE1	13	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
AVE2	13	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
5	14	0.00	0.50	0.10	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80
AVE1	14	0.00	0.50	0.10	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80
AVE2	14	0.00	0.22	0.04	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
1	15	0.25	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45
5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	15	0.13	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
AVE2	15	0.05	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
10	16	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
11	16	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
AVE1	16	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
AVE2	16	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
11	17	0.25	0.25	0.04	0.15	0.50	0.25	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04
AVE1	17	0.25	0.25	0.04	0.15	0.50	0.25	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04
AVE2	17	0.08	0.08	0.01	0.05	0.16	0.08	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
WTGD SCORE		0.35	0.30	0.13	0.16	0.88	0.50	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.51

Question 10. What are the differences in man-machine skill requirements between the new system and the current systems which it replaces?

Element

1.1	Monitoring Displays	1.5	Decision-Making
1.2	Tracking Outside Aircraft	1.6	Physical Responses
1.3	Recognition	1.7	Other (Specify)
1.4	Memory	1.8	Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	IDSV

TABLE D-13

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 11

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.02	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
AVE1	11	0.02	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
AVE2	11	0.01	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
6	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE2	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	14	0.05	0.30	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
AVE1	14	0.05	0.30	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
AVE2	14	0.02	0.13	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
1	15	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	15	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
AVE2	15	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
10	16	0.02	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
11	16	0.02	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
AVE1	16	0.02	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
AVE2	16	0.02	0.10	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
11	17	0.05	0.30	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
11	17	0.05	0.30	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
AVE1	17	0.05	0.30	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
AVE2	17	0.02	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
WTGD SCORE		0.07	0.43	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68

Question 11. What are the differences in crew interaction requirements between the new system and the current systems which it replaces?

Element

1.1 Verbal Exchange
1.2 Non-Verbal Exchange
1.3 Coordinated Physical Responses
1.4 Other (Specify)
1.5 Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	IDSV

TABLE D-14

ELEMENT RATING VERSUS SUBSYSTEM FOR QUESTION # 12

QSN#	SYS#	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	SUM
6	11	0.00	0.00	1.00	0.30	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34
AVE1	11	0.00	0.00	1.00	0.30	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34
AVE2	11	0.00	0.00	0.72	0.22	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
6	12	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE1	12	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
AVE2	12	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
5	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
AVE1	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
AVE2	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
5	14	0.00	0.00	0.00	0.00	0.00	0.15	0.20	0.15	0.25	0.20	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	1.03
AVE1	14	0.00	0.00	0.00	0.00	0.00	0.15	0.20	0.15	0.25	0.20	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	1.03
AVE2	14	0.00	0.00	0.00	0.00	0.00	0.06	0.09	0.06	0.11	0.09	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.44
1	15	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.15	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE1	15	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.08	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
AVE2	15	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
10	16	0.10	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85
11	16	0.10	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85
AVE1	16	0.10	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85
AVE2	16	0.08	0.20	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69
11	17	0.25	0.25	0.50	0.15	0.10	0.30	0.40	0.30	0.50	1.00	0.10	0.20	0.20	0.60	0.40	0.20	0.00	0.00	5.45
AVE1	17	0.25	0.25	0.50	0.15	0.10	0.30	0.40	0.30	0.50	1.00	0.10	0.20	0.20	0.60	0.40	0.20	0.00	0.00	5.45
AVE2	17	0.08	0.08	0.16	0.05	0.03	0.10	0.13	0.10	0.16	0.32	0.03	0.06	0.06	0.19	0.13	0.06	0.00	0.00	1.74
WTGD SCORE		0.16	0.32	1.28	0.26	0.05	0.17	0.21	0.24	0.27	0.41	0.04	0.06	0.10	0.19	0.13	0.06	0.00	0.00	3.98

Question 12. In terms of training methods, how much difference will there be between the new system and the current systems it replaces?

Element

1.1 Basic Flying
1.2 Instrument Flying
1.3 Nap of Earth Flying
1.4 Navigation
1.5 Communications
1.6 Target Detection
1.7 Target Attack
1.8 Weapon Aiming and Firing
1.9 Air-to-Air Combat Flight Maneuvers

1.10 Air-to-Ground Combat Flight Maneuvers
1.11 Multiple Aircraft Operations
1.12 Reconnaissance
1.13 Command and Control
　　　Information Processing
1.14 Other (Specify)
1.15 Other (Specify)

System #	Description
11	ADAS
12	Landing System
13	A/C Rocket System
14	A/C Guns
15	Fire Control
16	ADOCS
17	IDSV

APPENDIX E
BEHAVIORAL RESEARCH LITERATURE

Behavioral research literature on Army aviation was reviewed using the methodologies discussed in Section 2, Volume I. The review covered several information data bases. Titles and abstracts obtained from these information searches were screened to further identify those important to this study. These important sources were then arranged into subject categories and sub-categories in a computerized data file to facilitate the in-depth literature review.

The sources were arranged into seven subject categories: aircraft systems, subsystems, technology, procedures/tactics, training methods, training devices, and personnel. Each category consists of several sub-categories as shown in Table E-1. The computerized data file operates in an interactive mode which allows users to request information by selected subject categories.

Each literature citation lists the author's name, document title, and date of publication. Citations related to multiple subject areas are cross referenced and listed after the citation's first appearance in the file. A complete list of the behavioral research literature reviewed in this study is shown in Table E-2.

This initial categorization suggested the need for a somewhat different categorization and a reduction of the bibliography to emphasize those documents which deal more specifically with behavioral research related to Army aviation training. This second arrangement of the bibliography is described in Section 9, Volume I, along with the corresponding bibliographic citations.

TABLE E-1

SUBJECT CATEGORIES FOR ARMY TRAINING PROJECT

1. AIRCRAFT SYSTEMS

   1.1 Advanced Attack Helicopter (AAH)
   1.2 Advanced Scout Helicopter (ASH)
   1.3 SEMA-X
   1.4 UH-60, Black Hawk
   1.5 UH-X
   1.6 Remotely Piloted Vehicles (RPVS)
   1.7 Others

2. SUBSYSTEMS

   2.1 Foreward Looking Infrared (FLIR)
   2.2 Night Vision Subsystems
   2.3 Mast Mounted Sight (MMS)
   2.4 Global Positioning System (GPS)
   2.5 Position Location of Reporting System (PLRS)
   2.6 Head Up Dispaly/Helmet Mounted Display (HUD/HMD)
   2.7 Wire Guided Missiles
   2.8 Target Acquisition and Designation System (TADS)
   2.9 Display Subsystems
   2.10 Other Subsystems

3. TECHNOLOGY

   3.1 Aeromechanics and Flight Control
   3.2 Propulsion
   3.3 Structures
   3.4 Aircraft Electronics (Avionics)
   3.5 Weapons
   3.6 Mission Support
   3.7 Systems Integration
   3.8 Behavioral and Medical
   3.9 Cockpit Lighting
   3.10 Information Transfer
   3.11 Planning

4. PROCEDURES/TACTICS

   4.1 Nap-of-the-Earth (NOE) Flight
   4.2 Air Combat
   4.3 Air-to-Ground Tactics
   4.4 Battlefield Management
   4.5 Threats
   4.6 Weather Operations
   4.7 Inflight Refueling
   4.8 Instrument Training
   4.9 Other

5.	TRAINING METHODS	5.1	Adaptive Training
		5.2	Computer Aided Instruction (CAI)
		5.3	Performance Measurement
		5.4	Training Manuals
6.	TRAINING DEVICES	6.1	Simulators
		6.2	Procedures Trainers
		6.3	NOE Training Device
		6.4	Eye-Safe LASER
		6.5	Video Tape Replay
7.	PERSONNEL	7.1	Selection
		7.2	Training Attrition
		7.3	Visual Perception
		7.4	Transfer of Training

TABLE E-2

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1.3 SEMA-X
1.4 UH-60, BLACKHAWK
1.5 UH-X

    (SEE 1.7)

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THOMAS, G. TERRY (6.1)

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